605 V.15 1337

# THE FOUNDRY

VOL. 15. DETROIT, MICH., SEPTEMBER, 1899. No. 85.

## Molding Columns.

By R. H. PALMER.

While some foundries insist upon whole patterns for round columns, others will use patterns split lengthwise through the center, drawing one-half from the drag and the other half from the cope.

Each style of patterns has its advantages, and where a man is used to handling whole patterns, and bedding in the floor or flask, he will mold up a column as quickly as a man using the split pattern.

On the other hand if they are made in a shop where ramming up in the drag and rolling over is the rule, and where men are not used to bedding in work, save an occasional piece, it will take some little time for them to become accustomed to bedding a column into a drag and do it as easily and quickly as they would place a half pattern on a board with the drag, ram it up and roll it over.

In molding the round column and bedding it in, place the bottom board on the floor and wedge up under the ends of cleats, letting the center of same rest on bed running lengthwise. Use a long straight edge and spirit level to see that the whole is in proper position. Next place drag on the board and ram up as high as wanted. Take Fig. 5 for an example; the sand should be rammed up to point C, after which the strike A should be used to sweep the outline as shown at A, letting the guide D slide on the joint of the flask and shoulder inside. After this, give the bed a good venting down to bottom-board, and then place a thickness of facing on the swept-up bed, bringing it as high as line B. Cut out the sand for brakcet E, Fig. 2. Take strike B, and sweep out lines B, Fig. 5.

The whole pattern should now be placed in the groove formed, and a block of wood hollowed out to fit one-half the circumference of the pattern used to rap it down one-quarter of an inch, leaving the facing sand an inch thick.

After ascertaining that the pattern is in the right place by the help of the straight edge, lay some weights thereon and with your hand, tuck the facing sand next to the pattern. More facing sand can now be plac 1 against the pattern, and the drag filled with sand and rammed up as far as the round straight part. The bracket E, Figs. 2 and 4, must be rammed around with a small rammer, well tucked and also vented right. Take strike A, Fig. 3, and run over the pattern forming the joint at the center thereof as in Fig. 8. Place loose bracket piece EX, Figs. 2 and 8, on pattern and the cope is ready to be rammed up when the gatesticks, BH and riser F, Fig. 2, should be placed as shown in cross-sectional view, Fig. 4.

In facing the cope side of the mold, reduce the strength of the facing sand, otherwise there is danger of coldshuts as when the iron reaches this point it is liable to have lost some of its fluidity if poured at the right temperature to get a good smooth column. Before lifting the cope, rap the pattern with a bar rammed up in same.

The cores for bolt holes, D, Fig. 4, are in most shops, when possible, made so they will stop themselves off. In all cases they must be well secured.

The sharpened chaplets are next driven where wanted, A, Fig. 2. In those that are used to simply hold up the core it makes little difference whether the heads are made the circle of the core or flat, as they carry but little more weight than that of the core, but the Chaplets K, Fig. 2, take the upward strain during casting, and if the plates on these chaplet stems are not large enough to cover sufficient surface of the core, they will be forced into same, thus allowing it to rise and in this way causing the column to be thicker on one side than the other. In these days when columns are bored and calipered to find the exact thickness, careless setting of the core may cause some to be rejected.

Some foundries use a plate similar to the shape of a piece of T iron, ramming it up

4-7-30 SEP 15

Tech 55



in the core. When the cope is spaced off, a common round-headed chaplet is used, the head resting on the above mentioned plate.

I have always found that if a chaplet is used with the head bent to nearly the same circle as that of the core, that the latter would stay where wedged. In setting the core it is better to set it a little scant on the drag side as it is seldom that there is not a slight increase in thickness on the bottom side due to the tendency of the iron to raise the core and also to the greater pressure on the drag side of the mold.

The cope chaplets are, while the mold is being closed, held in position by the sand being pinched, or a lump of damp clay squeezed around them. The chaplets, to keep the core from moving sideways, are held in place by having a wedge or spike shoved down against their outer ends.

A plate bent to the circle of the core and rammed up with it on the cope side may also be used in place of rounded chaplet heads, and an ordinary chaplet may then be employed. Such plates should be about three inches long and two inches wide, and at least an eighth of an inch thick. Where a chaplet with a large head is used it is important that the chaplet stem should have a shoulder on it to support the plate.

Castings made for the purpose of holding down the chaplets are laid across the top of flask at K, Figs. 1 and 2, the part resting on the sides of the flask extending below the part crossing the cope about one-half inch, which allows the chaplet stems to come very nearly to the top of the flask. After the side clamps X are placed, and wedges S, Fig. 2, shoved between clamp and the binder K, the side clamps are tightened and wedge T, Fig. 1, is pushed over the chaplet stem to hold down the core.

Many devices have been made for holding down the chaplets and expediate the securing of same. Some foundries use one of the flask bars with a lip on one side for this purpose, wedging between the lip and chaplet. In one foundry I saw an iron bar with a square hole cast in it, and then an arm dropping into this hole. As far as I know results were not satisfactory with this method.

In ramming up the cope, blocks are set on core prints at ends of pattern and these spaces rammed up after closing the mold; this gives a chance to ram in sand at the end of W, Fig. 1, first running a rod through the hole in end of flask M, Fig. 8, into vent of core and replacing the gatesticks and building runners CO, Fig. 2. This way of proceeding gives a clear vent. In making the core some will make two half cores, and simply wire them together, dividing the vent hole in each half. One of the best arrangements I ever saw was a whole core box, the upper half of which was made in two parts. After the lower half was rammed up, a sweep was used to form the top half of core, when the top part of core box was rapped down to insure evenness throughout. Making a core this way requires a dryer.

For making round columns I like a flask best, even where the pattern is a whole pattern and the rigging is all for bedding it in.

In molding square columns I am partial to the method of bedding them direct in the floor unless one has quite a number to make when I prefer a flask with iron bars in drag, and rolling the drag over as I have always found they could be made quicker in that way.

Fig. 7, O, shows a plank bedded firmly in the bottom of the pit, and covered with about five inches of cinders as shown at N, these being in turn covered with a thin layer of straw, or hay to keep the sand from getting into same. In this way it is not necessary to take up the bed after each mold is cast as gaspipes, J. Figs. 6 and 7 are connected with the cinder bed and ends above ground where they can be stopped up with a bunch of rags after pouring.

In this way of making columns sand is rammed on the top of cinder bed to the height wanted, and then vented when it is covered with facing sand and pattern rapped down. A bed can also be made by using sweeps and straight edges.

After the mold is finished, chaplets K, X, Fig. 7, are driven down through to the plank. The sand around the sides of core print is cut nearly away and the core put in place when pieces of wood the thickness of the sides of the column are used for stop-off pieces. After ramming up alongside the core to T, Fig. 7, take the core with the gate in it, as L, Fig. 7, and place this against the main core with gatestick V in the position shown. A piece of rope can be used to form vent hole, S, Fig. 7.

A strip of wood the right thickness forms

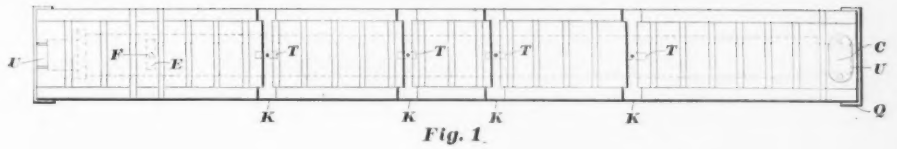



Fig. 1

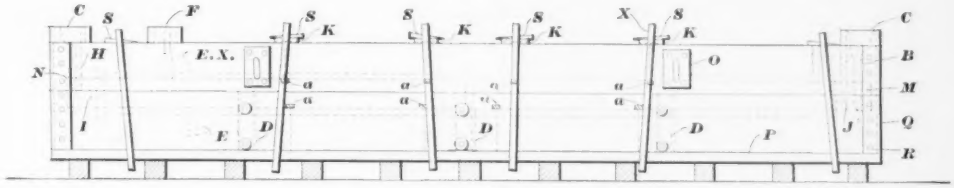



Fig. 2

The Foundry

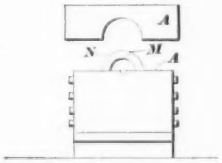



Fig. 3

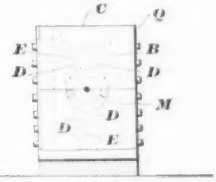



Fig. 4

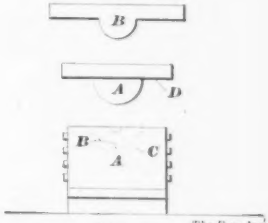



Fig. 5

The Foundry

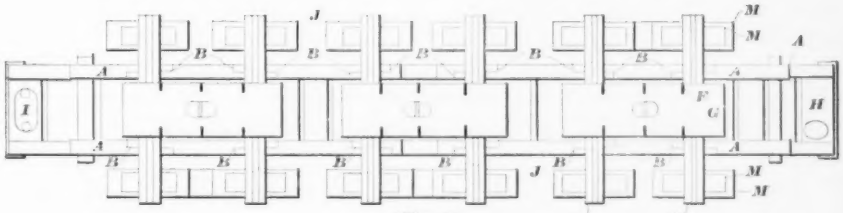



Fig. 6

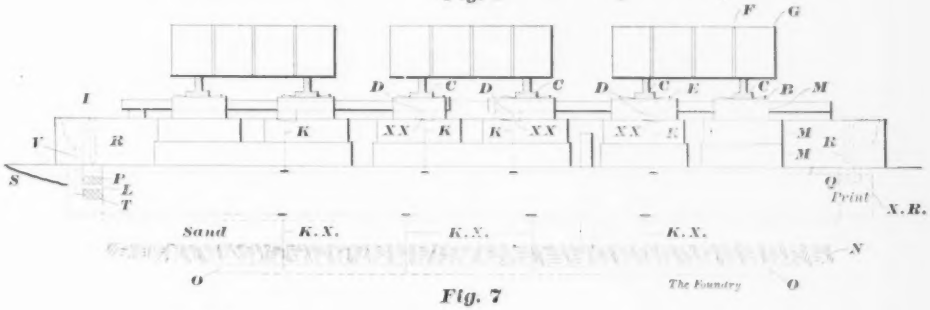



Fig. 7

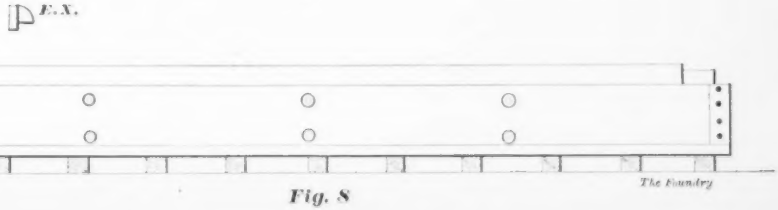



Fig. 8

The Foundry

stop-off piece for the cope side of mold. The space between the last bars and ends of flask are not rammed up till the mold is closed when the gatesticks are placed and the runnners rammed up at the same time.

In trying on the cope take a piece of clay soft enough to give, and see what the thickness is on cope side. If plates are used in the core these plugs will also show where to place the chaplets K.

In the method shown the cope must be weighted down. Take the same binders as used when molding with a complete flask to hold down chaplets, the cope being the same in both cases, and place them across the flask. Then lay some heavy clamps, or pieces of 3x4-inch scantlings lengthwise of the flask on top in the same place where the top of the clamp would come if a whole flask were used. In putting on the weights there is not enough sand under the flask to hold up the weight because there is not surface enough covered by it. So we take blocking marked MM, Fig. 7, placing it along each side of flask and letting it come a little higher than the strips running lengthwise of the flask, A A, Fig. 6. Place binders C C, Figs. 6 and 7, across the flask, ends resting on blocking M, then the weights G G, Figs. 6 and 7, are lowered on the binders, thus leaving the total weight on the blocking, when a chance is given to wedge between the pieces A and the binders C, as shown as B, Figs. 6 and 7.

When the mold is poured the strain is caught by these wedges, holding against binders C, which have the weights resting on them, the cores being held by wedges K under small cross binders D, Figs. 6 and 7.

Many times it pays to cradle the weights in this way rather than to run the risk of crushing in the mold or having the cope raise by not having weight enough to hold it.

In molding pilasters or square columns, having one side open, the under one generally, so as to have the pattern form its own core, the ends will come up in cooling. Anyone after having some experience can judge about how much the ends will come up as some mixtures of iron have a tendency, it seems, to draw more than others. I have found that in mixing iron for building work it pays to get a mixture you can depend on to shrink uniformly and then stick to it. I have found pilasters will come up 5/8 of an inch in 12 to 14 feet. By having the patterns bent the opposite way the castings will come out about straight.

## Some Hornswoggler Troubles.

By A. HORNSWOGGLER.

The readers of this paper will recollect that in the January, 1898, issue of THE FOUNDRY, I first gave the world at large an insight into the Hornswoggler system of producing any class of castings with any desired qualities from any kind of pig iron and scrap that happened to be laying around the backyard, and which nobody would carry away as a gift. In the April, 1898, issue of THE FOUNDRY I gave a further illustration of what could be accomplished with the Hornswoggler process. This all happened more than a year ago, and as I am in receipt of continual inquiries as to how the process I have honored with my name is getting along, I am going to give the foundrymen of the world another installment of Hornswoggler Notes of Progress.

The Hornswoggler system is the greatest process that has ever been invented. To all foundrymen it is the A B C of how to get something for nothing. A great many foundrymen, it is true, have not yet taken advantage of my illustration, showing how the thing ought to work, to install the process, but this is undoubtedly caused by the fact that a great many foundrymen know, or at least think they know, more about the foundry business than I do. For the edification of such I will say that the Hornswoggler process has never failed in operation wherever it has been permanently adopted, which has been nowhere. I have been asked to install a plant several times, but in view of the fact that other processes have failed to produce anything except the first installment for their inventors I have been loth to create any undue excitement in the metallurgical world just now when everything is becoming standardized.

I have never had in view to become a second Bessemer. Financial gain has not been my motive in conducting the Hornswoggler experiments. At the same time I am rudely pained by the fact that some persons have attempted to go the Hornswoggler family one better. One of the most notorious infringers on my claims of making anything from stove plate to the finest watch

springs direct from the cupola has been the promoters of the Damroty process in different parts of the world, notably those branches of the family located outside of the jurisdiction of the United States and the Philippines. The Hornswoggler process has not so far crossed the ocean on account of fear of seasickness, but as soon as a suitable remedy is found it will invade England and the continent in great shape. Meanwhile I intend to call on the international copyright law for protection.

Imitation is the sincerest flattery. When I illustrated the Hornswoggler system in the first place, I showed something that would work, something that, to say the least, would make the wheels go around. Just as I was beginning to imagine that the Hornswoggler process would supersede all others, I find the following in an English journal:

THE DAMROTY IRON-CASTINGS PROCESS.

Several months ago a company called the Damroty Iron-Castings Process Company, Limited, was formed in England to exploit a so-called improvement in cupola practice, the invention of Tiddlewink Damroty. The company took offices where they could get them, and since then have no doubt been working their invention to the satisfaction of the shareholders. A plant is said to have been put up in a foundry in the North of London, but as information as to the results obtained there have not been forthcoming we have taken the trouble to investigate the process.

On a consideration of the Damroty process from a technical aspect, the reasons for reticence on the part of the company become more evident. The process has for its object the production of steel direct from iron in the same cupola in which the iron is melted. Ordinary iron castings can, however, be made if desired. The cupola is divided into two chambers, viz., an upper chamber in which the pig iron and fuel are placed. The melted iron falls into a second or lower chamber, and is there converted into steel direct, by blowing air on to the surface of the molten metal.

The inventor states that an ordinary cupola shell may be used, with a somewhat funnel-shaped base to form the upper chamber and having a central opening leading to the converting chamber, the duct serving the double purpose of allowing the air blast to pass up from the converter into the melting chamber and the iron as it melts to fall through into the converter. The 'converter' chamber should be rather shallow, but of sufficient depth to contain enough molten metal for the air blast to act on. The general arrangement of the cupola is shown in Fig. 1. Fig. 2 is a detailed view of the tuyere opening into the converter and of the apparatus for controlling the blast, while Fig. 3 is a perspective view of the fireclay portion of the tuyere, which projects into the converter. The blast enters the converter through the fireclay nozzle. The arrangement for leading the blast to the nozzle (Fig. 2) is an adjustable tuyere, viz., by means of a horizontal pipe from which the nozzle projects. The pipe is enclosed in an air-tight manner on the exterior of the shell by a stuffing box at each end. This pipe can be turned by means of the lever shown in the drawing, and thereby the blast directed downwards onto the molten metal in the 'converter.' The blast then passes up into the melting chamber.

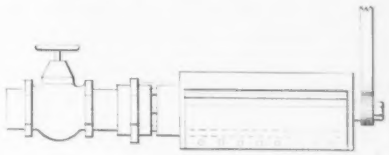


*Fig. 2*

*Fig. 3*

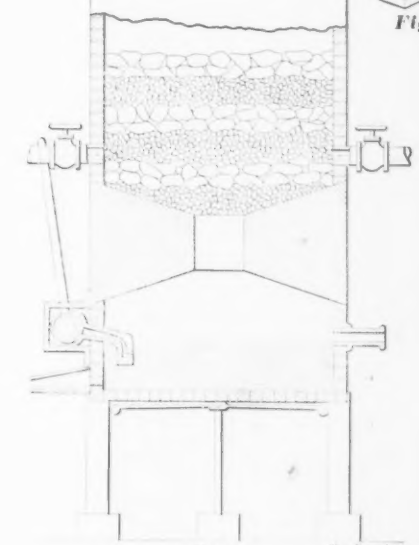


*Fig. 1.* *The Foundry*

THE DAMROTY IRON-CASTINGS PROCESS.

"The above description is not one that is likely to make the practical iron founder or steel melter sanguine of its success. In fact, the idea is an old one, and has been repeatedly tried in one form or another. The details may differ, but the fact remains that processes of this kind have not been a success since as far back as 1844. Mr. Joshua

Marshall Heath took out a patent for an arrangement somewhat similar in principle, and in later days Mr. James Riley, of Glasgow, has put into operation a combined cupola and open-hearth furnace. If the principle was not a success in Mr. Riley's experienced hands, in its modified form, it is not likely to be made so by the Damroty's Ironcastings Process Company.

I do not blame this British journal for criticising the Damroty process the way it does. That process is the rankest kind of an imitation on the Hornswoggler system. Why look at the illustration itself, you foundrymen, and then tell me what you think of it. Here these Damroty people have got up something that may be anything from a soda fountain to a bootblack-stand. If you will look closely at the curious illustration shown herewith you will see that there is what purports to be two rows of tuyeres. The lower row is supposed to convert the melted iron into steel, while the office of the upper is merely to melt the iron so that it drops into the converter or lower chamber. Now it is possible that my eyes may be different from other people's eyes, but the way the thing appears to me is this: At the bottom of the melting chamber, located above the converting chamber, there is what appears to me to be a lot of peanuts. It may possibly be crushed coke, the refuse from unloading cars maybe, as the Damroty process is great for saving everything. Above this layer of peanuts there appears to me to be a layer of rocks, such as are found in their natural form in the State of Missouri. Above this are two more layers of peanuts and the same number of rocks, which may be intended to represent pig iron.

Now, as the originator of the Hornswoggler process, I consider it my privilege to ask the heirs to the Damroty principle of seeing things that no one else can see, how under heaven they intend to melt the first layer of rocks or pig iron which is placed below the tuyeres?

I don't object to people with a common school education trying to improve on the Hornswoggler ideas, because I know these are scientific enough to defy competition. However, I do draw a line on having common ignoramuses bring my process into disrepute by trying to melt iron below the tuyeres. If there is any more new principles to be invented in fuel economy around the cupola the Hornswoggler family desire that honor.

Another thing that bothers me to account for is what keeps the peanuts shown from dropping into the converting chamber. I should also like to know whether they lift that part of the cupola, on which the peanuts rest, out through the top of cupola, when it is desired to drop the bottom.

I admire the arrangement of valves shown. In common with the Hornswoggler people the Damroty family is always able to do a good job of plumbing, on paper, and in an illustration of this kind it adds dignity by having something that no one can say what it is intended for or what is the good of it.

As I said before, the Hornswoggler systems are not gotten up for the sake of making money. If people will insist on using the Damroty process as shown I want to offer a few improvements, no charge for the suggestion of course.

The way the process is shown it will cost money to put those false bottoms into the cupola and make it very unhandy for the cupola tender to get in and out of the manholes not shown. My idea, the Hornswoggler idea, is that the converting chamber as shown is not necessary in order to make steel direct from the cupola. Instead of going to all this trouble, I would simply tap the iron into a ladle the same as is usually done. When the desired quantity of metal had been secured in the ladle I would take a common piece of garden hose which my neighbors had discarded, and reinforce this with a piece of gas pipe; this I would then insert in the ladle of iron, and by the help of a valve, similar to those found in cornplanters, turn on the blast. The principle is the same as in the Damroty process, but my system has the advantage of less cost in the first place, and the ability to convert each handladle of iron as it is tapped, thus permitting the casting of steel ranges. With the aid of the garden hose any kind of metal from razor steel to wrought iron castings may be produced.

As a grand finale to the publication of the above article in the British journal, I append the following apology of its editor, who is evidently in need of some American backbone stiffener:

## THE DAMROTY IRON CASTINGS PROCESS.

### APOLOGY.

The solicitors for the above company having communicated with us in reference to the article in our issue of March 3, we gladly insert the following explanation and apology in the form requested by them:

"We published under the above heading in our issue of March 3 an article which, we regret to find, is not in accordance with facts.

"The process for the production of steel direct from iron in the cupola in which it is melted, of which we gave a description and illustration, is not owned by the Damroty Iron-castings Process, Limited, nor worked by them.

"We, therefore, beg to withdraw our statements and to apologize for the article in question having been published by us."

We think it proper to add to the above that the error occurred through the fact that one of our staff, in the course of his ordinary duties, having the specification of a patent which bore the name of "Tiddlewink Damroty" before him, incorrectly assumed that it was the patent on which the process of the Damroty Castings Company is founded. The editor, being absent, had not the opportunity of seeing the article until it appeared.

In this country we say: "All coons look alike to us." I will add that to the Hornswoggler family all Damroty processes have the same appearance, and work successfully to the utmost limit only where the proprietors of the shops, where the process is being tried, have lost seventy-five per cent of the faculties with which nature originally endowed them.

## How to Become a Foundry Foreman.

By W. H. KANE.

This is a question that has often been asked by the ambitious molder. It has also been the subject of much discussion in The Foundry and has been answered very favorably. Still I do not think there has been enough said on the subject as the man who would make a foreman for one firm would not do for another.

What makes a successful foreman is a very difficult question to answer but the most successful men are those of integrity and sobriety, and men who are not afraid to enforce their orders or commands. Both foundry theory and practice are rapidly extending with the general advancement of our economic interests and the man, whether he be a foreman or molder who does not make use of the modern aids to information among which are to be counted the various foundrymen's associations and literature, is going to be left behind. A personal friendship should exist between foundry foremen and superintendents of different plants with the object of exchanging the innumerable hints and suggestions which come from different shops. Those who do not do so will soon be found struggling with what seems to them adverse fate, but what in reality is inferior knowledge or plainly speaking—ignorance. The average molder should read the books published on current foundry practice and also periodicals treating on the same subject.

No foreman should ever get conceited and think he is the whole thing and that the men under his charge are not up to his standard, although I believe that a foreman should not associate too close with his men, for this makes them expect too much of him, but he should treat them with due consideration and be frank and fair and never a bull-dozer. He should push his business and not have his business pushing him; it should also be his aim to keep up with the march of progress in modern appliances and improvements. By doing this he can keep his men satisfied, reduce the cost of production, which is the most important factor, and make money for his firm. Do not make people believe that you know more than you really do, but when you feel that you are right stick to it. Above all, never go from one man to another and talk about the first one. When you have anything to say, go and say it to his face. If he is in the wrong and apologizes to you like a man, forgive him in as few words as possible unless it is an old offense; if so, haul him over the coals; don't get angry and swear; talk severely, and to the point.

Never keep a man under your charge to get even with him for some offense he has done you. The most honorable way will be to discharge him and then you won't be tantilized or persecuted by his looks or his actions. It is the duty of the foreman to regulate the wages of his men who work by the day, also to set all prices on piece work, and in justice to the molders, his company and himself, he must aim to give a fair day's pay for a fair day's work and to add a premium to the molder putting up more than a regular day's work. For instance, the price paid for a job on the bench:

is five cents and you are getting from fifty to sixty molds per day. When you want more castings, say to the molder "if you make $20.00 per week I will give you a premium of $2, or I will raise the job to 5½ cents per mold for all molds when you make $20. In this way every molder can raise his own wages. This rule can be applied to any priced pattern and will materially increase the output, the same amount of labor being able to handle the extra castings without any additional cost. Every foreman should assist in producing all he can, for the more work the molder turns out, the cheaper the product. The molders are the only men that the firm is making any money off, for since they are the only producers they have to make up for all other employes. You can at times go to other departments and always find some one that is willing to stop and converse a few minutes. As they are all paid for their time it matters not to them, but all of this must come from the molders' product. With the piece work molders, if they stop for anything their pay stops and the production stops and the average cost per ton goes up. When this occurs the office is liable to think that the jobs are paying too much and the result is that a sweeping reduction is made in the foundry.

I have known of case where the foundry foreman had to make his estimates from old castings and when the patterns arrived in a dilapidated condition he was asked to turn out castings at the same cost, which he had calculated to do with good patterns. When all other employes quit work and went home contented the foundry was running late heats and worked the molders as long as physical endurance held out. In some cases there is a tendency to deprive the foundry foreman of the authority that belongs to him but such can only result in relieving him of all responsibility. A foreman should have the co-operation of all from the office man to the assorter of castings, if he shows the right disposition and is capable of getting out work with promptness and as cheap as any of his competitors. He can do this by keeping molders and other skilled labor at their places, and have laborers to cut sand, shake out, mix facing, carry in and out flasks and bottom boards, where jobs are changed, and carry iron where it is practical, in this way keeping the molders molding as long as possible. The real and the paying kind of a foreman will always surround himself with good mechanics, first-class tools and material. He will then be able to render his employers the best service and receive from the men under him that good-will so necessary to obtain the best results.

## Illustrating the Impossible.

BY CHARLES BUTTERFIELD.

One may talk or even write and his words are liable to misconstruction, but when one gets out working drawings, there is no chance for mistake.

There are undoubtedly many points in foundry practice with which we are all more or less unfamiliar, and which we would be better off for knowing. There are some methods again that we are better off for not knowing. I append herewith an article originally published in the Street Railway Review, the author being designated by the initial F., to which I think should be added O. O. L. The article reads as follows:

"MANUFACTURE OF BRONZE CAR ARTICLES.

"The use of bronze in connection with street railway car fittings has become quite extensive in recent years, and a short account of the process of manufacture may prove of interest. The copper is melted in a crucible set in a furnace especially designed for the work, and shown in cross section in Fig. 1; it is unnecessary to give the dimensions of the furnace, since the latter is in each case proportioned to suit the capacity of the crucible to be used. The arrangement of the cover A, and the stack outlets C, C, is seen in Fig. 1.

"The piece of apparatus next in importance is that for drying the phosphorus, which is shown in Fig. 2. Usually the phosphorus is dried in an open pan on a wire netting, and if the phosphorus ignites the pan is closed. The arrangement I employ may not be an improvement over the usual way, but it serves me very well. A stone jar of about four gallons capacity is fixed to the top of a sheet iron box; the box is 20 inches high, 12 inches deep and 4 feet long. Inside is a shell of sheet iron with numerous 1-inch holes drilled through it and covered with a sheet of asbestos. A water pipe leads into the bottom portion of the box and water is always kept there. For 75 pounds of copper I use about 3 pounds of phosphorus; I first put the phosphorus in a solution of vitriol in the stone jar, leaving the sticks for about 40 minutes; they are then placed upon the asbestos covered shelf and soon dry, the coating they have received in the solution protecting them from the air, obviating all danger of ignition and fit-

ting them to go into the crucible of melted copper.

"At first I experienced a great deal of difficulty in introducing the phosphorus into the molten copper, but finally succeeded by using a dip pipe, as shown in Fig. 3. This pipe is of cast iron, 3 inches in diameter inside with a funnel-shaped top. This pipe is held in place with the end below the surface of the metal by two workmen, while a third drops in the phosphorus, which quickly melts and mixes with the metal.

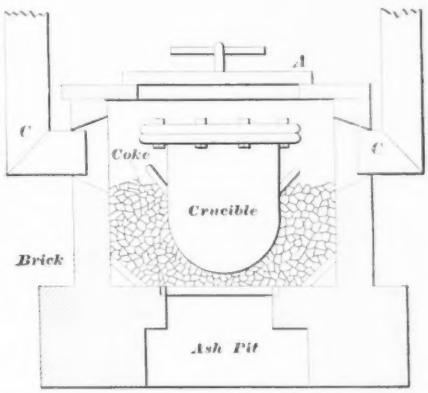



*Fig. 1*

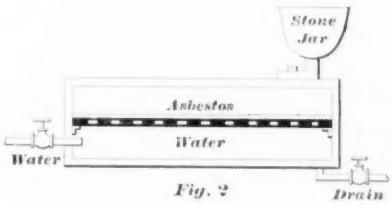



*Fig. 2*

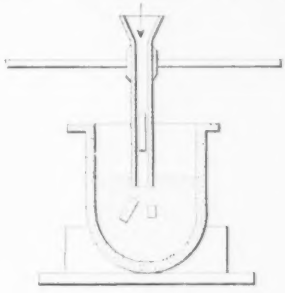


*Fig. 3*

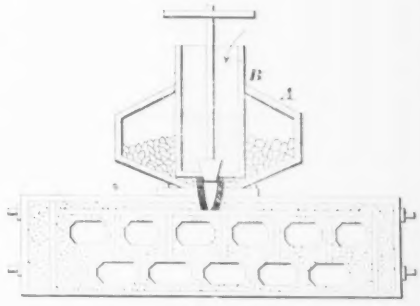



*Fig. 4*

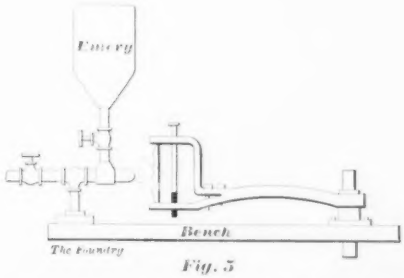



*Fig. 5*

"For casting, the arrangement shown in Fig. 4 was adopted after some experimenting. The flask, pouring gates, etc., do not differ from those commonly used and require no description, except to say that fine sand is preferable and that plumbago makes a good facing for the molds. The main gate B, however, should be provided with some means for heating the metal in it; some castings may be made without this apparently extra work of heating, but unless all the conditions are nearly perfect the metal will not flow as freely as it should and defective castings will result. The main gate is provided at the bottom with a stopper for closing the outlet into the mold. The heater, A, is a chamber of sheet iron with openings into which the main gate is set. The metal is poured into the main gate at the top and a coke fire in the heater keeps it hot.

"The finishing of phosphorus bronze castings is very similar to the finishing of nickel-plated castings, and it is only necessary to mention the novelties in the apparatus used. One of these is a mechanical scratcher built on the principle of the ordinary foundry tumbler, but covered on the interior with leather set with No. 30 steel wires; the falling of the castings on these flexible steel points for an hour or so gives the surface an odd and attractive appearance. Another arrangement for giving unique effects is the emery blast shown in Fig. 5. The casting is supported in a clamp at the end of a spring bracket set on a pivot so that the workmen bring any portion of the work in

front of the blast. About No. 70 emery is used."

Just why bronze for car fittings should need to be melted in a specially built crucible is something beyond any power of conception. The account of the process is interesting because it shows what kind of stuff some editors will accept.

It must take a heavy draft with this crucible since two chimneys are required. It is about the queerest looking crucible that has come to my notice. What appears to be ears on the sides, the round bottom and the bolts in the cover all attract attention.

F.'s plan in Fig. 2 for drying phosphorus is certainly original and the stone jar has the appearance of being built to order, too. At least it is the only one of its kind that has come under my notice.

Fig. 3 is ingenious. When I look at that crucible sitting in something that looks to me like a die for a quartz mill, I can't help but feel what wonderful improvements are being made. When I think of the melting point of copper and the cast iron funnel for introducing the phosphorus I am inclined to tell him to guess again.

Fig. 4 is the most remarkable conglomeration of the whole lot. No lunatic could devise anything more ridiculous. As near as I am able to understand F.'s case, it is something like this: He melts his copper in the special furnace, Fig. 1, and pours it into the tank in Fig. 4, previously inserting the phosphorus while the crucible is seated, as shown in Fig. 3. Now this special furnace must be out of kilt some place since the metal must be reheated in Fig. 4. If I haven't forgot all I ever knew, the addition of phosphorus increases the fluidity of copper, and very much so. Of course it is all right to reheat the metal, if this must be done, but I object to Mr. F. proposing to do his with his chamber of sheet iron as shown in Fig. 4. In the first place, a fire would not burn in the receptacle shown, because there is neither inlet nor outlet, and combustion cannot take place in vacuum; in the second place, sheet iron is not the right kind of material for containing a fire to warm up this kind of metal; fire bricks burn out quick enough, let alone sheet metal.

As far as F.'s method of finishing bronze castings is concerned, it is in keeping with the rest of his practice in making the castings, as he says, "It is only necessary to mention the novelties in the apparatus used" to see that it is a novelty indeed. His emery blast is likely to attract the fool-killer, however, unless he has it vaccinated at an early day.

Taking it altogether, this article is something which not even a thirty-second degree member of the Plumbago Club could get up. Talk about your Plum-Plum-Ji lassooing kangaroos with a boa-constrictor; in his wildest dreams this individual riding through the desert on a giraffe could not have thought of anything like this article on bronze founding which Mr. F. has furnished us, and although he says that fine sand is preferable, and that plumbago makes a good facing, I doubt if the Plumbago Club will take a party into membership who shows less knowledge of the subject on which he writes than a Hottentot with a three weeks' education.

This in itself is bad enough, but that journals professing to cater to the foundryman's interest should reproduce this article without a word of comment. Literally swallowing the whole thing as an appetizing relish, is still less credit to the intelligence these people are supposed to have.

## Shrinkage Strains.

By R. D. MOORE.

In considering internal strains it has long been known that large bodies of cast iron, in compact form, as for example a sheet roll, or a solid shaft, do not possess the full strength of the same material when cast into structures of less thickness.

It has been a matter of observation among lathe hands that when the turning tool reaches deep into the metal of a large shaft, the chips "come off easily," and the iron appears to be looser in the central portion. Evidently the compactness, or density, of the metal decreases as the mass increases.

The reason for this is very obvious. In cooling, the heat is necessarily conducted away from the outside first, which, after a time becomes solidified, then follows the next imaginary layer and so on, layer after layer, until solid to the center. This order of cooling is kept up until entirely cold, that is, each internal layer shrinks slower and requires longer time than the next adjoining outer layer; the consequence is that every particle of metal is under constraint.

that is, pulling inward on the next adjoining outward particle, leaving not a single particle in the whole mass that can be said to have exactly reached a position of repose.

This strain is not merely in a radial line only, but is also exerted in the two other lines, the tangential, and the longitudinal lines. Saw a two-inch section from the middle of a roll and you have a casting like a wheel in its outline and resting under precisely the same kind of strain that breaks the wheel, that being an internal strain, produced by the hub continuing to shrink after the rim has ceased to do so, as is evident by the separation of the arms at the fracture.

It has been repeatedly observed that the iron yields after a time, when under a great shrinkage strain. Cannon balls are known to diminish sensibly to the calipers for some time after casting. The outer shell evidently yields gradually to the internal pull, the movement extending to the very center and partially relieving the casting of its original strain.

Experiments have attested that cannon stand a heavier strain if allowed to rest several years before testing. The same relief is known to occur in wheels, they being much less liable to break if not used for a considerable time after casting.

This internal strain will necessarily be greater in a chilled roll than in a soft one, the rapidly conducting chill increasing the disproportion between the external and internal cooling. An interesting experiment is recorded where this was observed. Two experimental cannons were cast in Boston in 1847, for the United States, from the same melting, one in a mold heated to redness, the other cold. The former, in a test, proved much superior in strength. The red-hot mold prevented somewhat the unequal cooling that causes the internal strain under consideration.

A piston packing ring, say 1½ inch thick, exhibits a strong proof of this "pull." If we turn the outside only, when split the ends would stand apart slightly. In this case the distance from the skin to the center of the metal is only ¾ inch, but by turning off only 3-16 inch we have arrived at a point where the metal cools slower and requires longer time than at the outside; this is very delicate hair splitting, but sustains the theory laid down.

If the turning of the outside of the ring was continued nearly to the center, the gape would increase at every cut, because a still later shrinking section would be brought to the outside, increasing the outside pull, as a tight band.

If this internal strain is so perceptible in a thin casting what must it be in a "solid cast" cannon or a 24-inch roll, presenting a distance to the center of metal many times greater. In this connection it is proper to note that the heat added to the roll while at work also adds greatly to the strain originally contained when it left the lathe, and in exactly the same directions.

These two added strains on a roll are very difficult to, even roughly, estimate; we can simply call them enormous. In view of these facts it is more than probable that a shaft with a hole cast through it is stronger than a solid one, because the force that tears the metal particles asunder, is reduced by reducing the distance from the skin to the center of metal, or we may say by removing the central portion, which causes the most trouble.

An experiment showing how large a core would add the greatest strength to such a casting, would be very interesting if ever made.

One of the most interesting experiments ever tried to overcome the disastrous effects of this shrinkage strain, was in the casting of what was known as the Rodman cannon.

Clearly understanding the weakening effect of this internal strain upon cast iron cannon, led Capt. Rodman, of the United States army, about 1850, to introduce a new system of cannon founding, with the double object of not only preventing the internal strain, but at the same time producing a strain that would act in an exactly contrary direction.

For illustration, suppose we imagine a cannon as cast by placing one thin shell over another, slightly loose, until the usual thickness is obtained. It is clear that when the strain is exerted upon the inner shells, that it will be burst very easily, before the next shell can receive the full strain; the next shell, in its turn, receiving the full force, gives way also, and so every one is easily torn asunder. The cannon under internal strain has its different imaginary shells similarly situated, they having at-

tempted, and to some extent, succeeded, in tearing loose from the next outer shell. The strain in an opposite direction, as produced by the Rodman process, may be illustrated by imagining a gun constructed with a shell, the inside representing the bore of the gun; then a second shell, slightly too small to pass over the first, but which by heating can be expanded to receive the first one. On cooling the outer shell will shrink very tightly on the inner one; and the process may be so repeated until the gun is completed.

It is clear that in a gun thus constructed, all the bands resist the strain at the same instant, and that very nearly all the strength of the metal is made available at the time of explosion. It is more than probable that this external, or "hoop" strain, carried beyond a certain limit, may be detrimental to the strength of the gun.

The initial tension of the Rodman gun was determined by cutting a ring off the lower end of the feeding head and planing a radial cut. Just before the cut passes through, the ring snaps, and the amount of gape gives the relative tension. The government adopted as a rule of tension on a 15-inch gun that the radial cut should open 1-10 to 2-10 inch more on the outer end than the inner one.

Capt. Rodman by his system of internal cooling produced a strain very similar in character to that in the example given, and in much the same manner; namely, by cooling the inside layers of metal first, or exactly the reverse of the old method. This mode of cooling was accomplished by passing a current of water through a pipe down to the bottom of the core barrel, then flowing off at the top, the water being started just before casting. The core barrel was, of course, water tight. Grooves being formed on the outside to convey the gasses to the top.

The government made a great variety of tests of the difference in the strength of guns cast from the same melting, and the results all showed the superiority of the Rodman process over the old method. It is well known that the Rodman devise, as applied to cannon casting is of no value today because of the introduction of the modern forged gun, but it still remains an interesting subject, to foundrymen, by throwing light on the different strains of other structures of cast iron.

## Feeding, or the Compression of Metals.

By HERBERT M. RAMP.

Considerable debate has arisen through the columns of THE FOUNDRY over this rather complex question, and much ink has been poured out freely by those who desired to not alone express their own experience and conclusions, but to force others to believe their solution was the panacea for all the ills that shrinkage of iron brings about, and hence every other man who presumed to air his opinions was "antiquated," "ignorant" or "transcendental."

There is a disposition in foundry practice, as elsewhere, to belittle and sneer at anyone whose opinions differ from that of others, and who has the ability to put the same in print. There are too many contributors to foundry literature whose first object is to acquire a reputation for infallibility, who do not hesitate to hurl invective and sarcasm at anyone who opposes or shows there is a possibility of doing the same thing in another manner. Rarely has an item appeared in THE FOUNDRY that did not possess its grain of truth. Few indeed have been the articles given to the trade by practical men, that have not contained lessons of value and information. All of this is well to remember, but because a man has given time and study to a certain thing, it is no reason he should permit himself to be so puffed up with egotism and self-conceit as to think that there is nothing to be acquired on the road to progress beyond the distance he has traveled.

Men have disagreed since the creation as to ways and means of government, finance, religion, medicine and mechanics, but no one will say that there has not been truthful and successful men on both sides. Yet the avidity with which one mechanic attacks another because of this difference of opinion and experience, would lead one to believe they thought the wisdom of Solomon was resting within them, and that all others were pretenders or charlatans, while the truth is that they have held their own opinion so close to their eyes that it has obscured from their vision all else. Whereas if they held it off at arms length they would find themselves a very small speck on the horizon of the mechanical world. Mr. Roxburgh, of Scotland, comes back at Paul R. Ramp in the August FOUNDRY because the

latter differs with him upon the subject of shrinkage, and opens his article by finding fault because no more details were given in a sketch by Mr. Ramp. I am sure that the sketch is clear enough to anyone who understands the founding business. I know that to the average American foundryman it is not necessary to furnish a complete set of drawings and several pages of description to convey a simple idea, no matter what is essential across the water. Mr. Ramp made a plain statement of every-day practice in a foundry melting from thirty to forty tons for Corliss engines and railroad cylinders, and his statements were correct. These castings are made in exactly the way he describes, and they have never shown any of the dire results predicted by our friend from Scotland. Furthermore, I would state emphatically, that the cores do expand, and do effect shrinkage, else why, let me ask, is it that a hole cored in a casting shows less shrinkage than one made with green sand? Why is it that a casting made in green sand will show greater shrinkage than one made in dry sand and poured from the same ladle? These may be pertinent questions, but they apply in the case Mr. Ramp related; the cores and mold both expanding and effecting the shrinkage. The writer himself has made hundreds of locomotive cylinders and never put a riser on them and never had one returned when machined on account of any such defects in practice as pointed out by our esteemed brother founder in Scotland.

Theory may look very nice on paper; it may meet with applause and flatter the senses, but good sound castings cheaply produced bring more credit to the mechanic, and more dollars to the pocket of the employers, than all the pretty evolved theories than can be conceived at home or abroad. Mr. Roxburgh further states that a core is composed of material, 25 per cent of which "is as destructible by heat as snow is to a summer sun," and calls upon all "practical men" to bear him witness that cores for a cylinder must be composed of such material.

The writer does not know what kind of cores are made in Scotland, and therefore does not presume to criticise the practice there, but he does know that the days of horse-manure and sawdust have passed in this country. He does know that cores made in the instances spoken of did not contain over five per cent of destructible matter, and 25 per cent of iron in the form of rods, eyes and plates. He does know that in this land delicate cores are often made from nothing but sharp sand and clay wash. How much destructible matter would such a mixture contain? In this country no man gets black-balled because he departs from the path of tradition, or lays aside the hat his father wore.

Mr. Roxburgh states that "in the cylinders referred to it matters little whether fed or not, but alter the position and cast the same vertical, and feeding becomes an absolute necessity." It is a pleasure for me to state that I have done this very thing and found feeding no more necessary than before, Mr. Roxburgh's statement to the contrary notwithstanding. It is not assumed that an extremely heavy casting can be made without the use of the feeding rod. It is not claimed that a casting with very few or very small cores would supply shrinkage in this manner. We know a man could not make a ten-ton anvil block without feeding, but we also know there is much useless and unnecessary expense and trouble incurred where a little dispassionate reason and judgment free from prejudice would save money. We do know that we have not learned all there is to learn in the foundry business, and don't stand ready to define every other method which differs from us as "antiquated quackery," and with a lofty egotism ridicule and sneer at anything but the "good old way."

This is the age of progress, and we realize it. We know that old theories are overturned and old maxims given the lie, and while we believe the American mechanic is the superior of any class of workmen in the world, possessed of more ingenuity and skill; still while we are aware of all this, we have not the self-conceit to say that nothing good could come from Scotland, England, or any other place. We accept the truth as we find it and profit by others' experience, but are at all times ready to defend principles, which our lives in the shops have demonstrated to be practical.

### The Life of Ingot Molds.

In the manufacture of ingot molds, a pig which is both strong and pure is essential. In general it may be said that the silicon may vary between 1.50 and 3.50 per cent., manganese 0.60 to 1.20, carbon 3.50 to 4.40, sul-

phur up to 0.075, phosphorus up to 0.120, and copper up to 0.125. The amount of scrap in the charge regulates the percentage of silicon and manganese. If the coke is high in sulphur, a greater percentage of manganese is allowable. For instance, in the Ruhr, where the coke is low in sulphur, not over 0.8 per cent. of manganese is specified; but in East Germany the same specification could only result in a shorter life of the ingot mold, as the manganese present is not sufficient to eliminate all the sulphur. Arsenic is another element which may cause trouble. In ordinary blast-furnace practice, about one-third of the arsenic goes into the slag, while none escapes as gas. The greater proportion of this element will obviously be found in the pig-iron, and iron containing this element should not be used for ingot molds. This is of great importance when it is remembered that the iron ores from the south of Spain have been found to sometimes contain as much as 1½ per cent. of arsenic. The effect of arsenic on iron is similar to that of sulphur. The limit given above for the latter element should, therefore, be taken to mean the combined percentage of arsenic and sulphur. The normal composition of an ingot mold in Germany is stated as follows:

| | Per cent. |
|---|---|
| Silicon | 1.6 to 3.0 |
| Total carbon | 3.3 " 4.4 |
| Manganese | 0.5 " 1.1 |
| Sulphur | not over 0.075 |
| Phosphorus | " 0.125 |
| Copper | " 0.125 |

The percentage of silicon has little effect on the life of the ingot mold, those containing 1.6 per cent. having proved quite as serviceable as those with 2.8 per cent. This cannot be said of the silicon reduced from the lining of the cupola or from the ash. It is a well-known fact that iron, after pouring, contains a higher percentage of silicon than the original charge, usually due to an over-heating of the iron. The cupola temperature should be carefully watched.

The absorption of sulphur in the cupola means increasing the combined carbon in the iron at the expense of the total carbon. A pig containing 0.05 per cent. of sulphur and 4 per cent. of total carbon, when remelted with high sulphur coke, gave an ingot mold containing 0.27 per cent. of sulphur and only 2.8 per cent. of total carbon. The lower the percentage of total carbon the more marked will be the effect of the sulphur. Molds with 0.1 per cent. of sulphur are not desirable, but with 0.15 per cent. and above redshortness becomes marked, and the mold cracks and falls to pieces. The effect of phosphorus is similar to that of sulphur. With an otherwise good iron a phosphorus content of 0.125 gives no trouble, but if this rises to 0.18 matters become more serious. A high percentage of phosphorus is frequently due to an impure scrap, or to the phosphorus in the coke. The effect of copper is similar to that of phosphorus, and tends to hold the sulphur in the iron.

The use of manganese is beneficial. An ingot mold with 1 per cent. of manganese and normal sulphur will last much longer than one with only half the manganese. The carbon should be kept about 3½ per cent., and only when the ingot mold walls are thin should 4½ per cent. be allowed. The following are analyses of five molds, the first of which lasted through 250 heats:

| | I. | II. | III. | IV. | V. |
|---|---|---|---|---|---|
| Si | 2.65 | 1.66 | 2.80 | 2.82 | 2.16 |
| Mn | 1.00 | 0.55 | 0.83 | 0.83 | 0.73 |
| P | 0.064 | 0.050 | 0.12 | 0.12 | 0.06 |
| S | 0.061 | 0.043 | 0.04 | 0.04 | 0.07 |
| Cu | .... | 0.072 | 0.065 | 0.065 | 0.12 |
| C | .... | 3.45 | 4.40 | ..... | .... |

The foundry portion of the question must not be forgotten. There is the necessity of thoroughly drying the molds, casting at the proper time and in the proper way, and cooling carefully. In the steelworks sudden heating and irregular cooling produce molecular changes, which make it especially important to deal with the molds carefully. The following is the average German practice as to the thickness of the walls of an ingot mold:

| Weight, lbs. | | Thickness, inches. | |
|---|---|---|---|
| 770 | | 2.4 to 2.0 | |
| 1,100 to | 1,540 | 2.6 | 2.2 |
| 1,540 | 2,200 | 2.8 | 2.4 |
| 2,200 | 3,300 | 3.5 | 3.0 |
| 3,300 | 4,400 | 3.6 | 3.2 |
| 4,400 | 6,600 | 4.2 | 3.8 |
| 6,600 | 13,200 | 4.8 | 4.4 |
| 13,200 | 22,000 | 5.6 | 5.2 |
| 22,000 | 28,000 | 7.2 | 6.6 |

—Oscar Simmersbach in Stahl und Eisen.

## Whose is it?

A single foundry in New Jersey, it is said, casts annually 28,000 bells for the farmers and about 4,000 for schools, churches, engine houses and the like.—Exchange.

# THE FOUNDRY

*Published Monthly by*

THE FOUNDRY PUBLISHING CO.

DETROIT, MICH.

JOHN A. PENTON, - - - EDITOR.

**SUBSCRIPTION PRICE:**

$1.00 a year in advance, postage prepaid in the United States, Canada and Mexico.

$1.75 a year to other countries, postage prepaid. Single Copies, 15 Cents.

**ADVERTISING RATES ARE PRINTED IN EACH ISSUE.**

Space in advertising pages only is for sale.

Subscribers can have their mailing address changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.

**The Detroit News Co.** will supply the trade with THE FOUNDRY, through the regular channels of the American News Co.

**We want to obtain examples of current foundry practice. Photographs, drawings and descriptive matter, showing just what is being accomplished in the foundries of to-day, will be cheerfully paid for.**

**We can not furnish a continuous set of back numbers beyond the current year.**

Entered at the Post Office at Detroit, Mich., as second-class matter.


## 1892-1899.

With this issue THE FOUNDRY enters its eighth year, and, looking back upon the seven that have passed, we cannot but feel that they have been years of great changes, of constant evolution and improvement.

It is a common theory that man changes completely in seven years, and, although retaining his characteristics, these are all that remain, old tissues having been removed and new ones substituted. Looking upon that sixteen-page copy of THE FOUNDRY which appeared in September, 1892, we are forced to acknowledge that, but for its character, THE FOUNDRY, too, has undergone a total transformation.

The change has been so gradual that probably few of our readers can realize its extent without comparing our journal of to-day with some older issues. When we have preached to the foundries of the country the gospel of a better practice in their shops, we have taken a little of this advice ourselves in the publication of THE FOUNDRY.

Not only have we enlarged the paper, but we have made it better in every way. We have procured coated book paper in order to furnish first-class half-tone illustrations, and over the latter we have exercised the most rigid censorship, always demanding the best to be had.

While the majority of trade journals are a sort of Jack-of-all-trades, catering to a dozen or more different trades, we have resisted the temptation to take up anything outside of the foundry business. We feel it is more credit to us, and far better for our subscribers, that we should confine our energies solely to the founder's art, and do one thing well.

Our success as a trade paper is largely due to this purpose, nor do we at this time forget the help that has been extended us by advertisers and subscribers alike. Fault has been found with us occasionally, and we are sorry to say sometimes justly. Reaching, as we do, all English-speaking countries, besides the most important shops in other lands, our ideas have naturally often met with criticism from such a cosmopolitan audience.

As it is impossible for us to visit every shop and select such items and parts of practice as we should like to do, we again invite the men who work day after day to spend a few of their spare moments in writing us what they are doing. Such correspondence will be treated as specially valuable, and through THE FOUNDRY it is possible for all to become practically shopmates.

## Trade Outlook.

When the whole producing capacity of the country is taxed to its utmost to furnish material already contracted for, and new orders are taken with much reluctance, the outlook can be nothing but favorable. The foundry trade at large depends upon the stimulous of other industries to infuse it with life, and the reflection of the crowded conditions of shops to-day is the busiest picture the trade has seen for a decade.

The foundrymen are becoming possessed of a little backbone, too, in the matter of asking a price that shall involve no speculation as to whether a profit is to be made or not. Work is, however, being placed below some of the high quotations occasionally found in the daily press, because the latter usually represents some isolated case where a foundry has been unable or unwilling to make the work and purposely made a high price to end the matter.

As the scarcity of standard brands of iron proceeds it becomes more difficult to obtain

familiar mixtures to meet the requirements to which the foundries have been accustomed for some time. This is noticeable more in shops producing light work than anywhere else, and the changes which have been forced upon such has resulted in more or less inconvenience. Recourse has been had by the majority to silvery irons, which may in a measure account for its scarcity in spite of its price, and examples are not wanting where the theoretical advantages of such irons have not materialized to the extent desired.

Scrap iron has become an important factor, and this material can no longer be said to be a drug on the market. We have advices that in the mining camps of the Sierra Nevada mountains, in California and Nevada, the Pacific coast founders are purchasing all the scrap they can lay hands on for fourteen dollars a ton. When to this must be added the charge for hauling to the nearest railroad and subsequent freight rates, its real price is increased to no inconsiderable degree.

Much of the iron thus purchased is really not scrap, but machinery more or less out of date, which the owners find it profitable to get rid of during the present high wave of values. What is thus gotten rid of may in the end increase the demand for machinery to take its place. At any rate the good flushing the scrap market is getting will remove much old material that otherwise would have remained a landmark for years.

Several enterprises, under way or projected, for the manufacture of iron, have been started in Canada, but the total output of these can not materially affect the tremendous volume of business already being done in this country. Since several concerns have been compelled to reduce their working force because of a lack of finished material, it is rather a question to obtain this from any source. But for the high prices ruling abroad as well as at home, importation in certain lines would undoubtedly have taken place before this.

As a rule the foundrymen have underestimated their wants, basing them at the time of execution upon orders then at hand. It is an everyday occurrence for furnaces to be asked to hurry forward shipments of iron contracted for later delivery owing to greater demands being made upon the foundries. When it is understood that furnaces have all they can do, and more too, to meet existing contracts within the specified time, the position of the consumer may be better understood.

Contracts are reported as placed as far ahead as the latter part of next year at substantially the prices governing to-day. Here and there a firm may be found who hesitate to take hold of the market in its present condition, as they also did earlier in the year, but their number is so insignificant as to exert no influence at all and later they may be further taxed for the delay in providing for the future.

One more feature worth noticing is the number of abandoned or ill-managed foundries, which succumbed to their own internal faults years ago, that are now being leased or purchased by more prosperous concerns, who find themselves either unable to increase the output of their own foundries or having no foundry of their own, desire to obtain their castings more promptly, if not at a less cost, than outside foundries are able to guarantee. The number of shops being thus resuscitated would make a long list.

---

### Gone Astray.

The American Machinist tells in a jocular way of "one of the best and most experienced brass molders in the United States" who has temporarily shook the dust of the sand heap from himself and gone into the business of inventing. His first start has been in the direction of revolutionizing marine transportation, and with a beginning like that there is no saying how far he may go.

The only thing we take exception to, in the advertising which this individual is securing, is that he is alluded to as being one of the best and most experienced brass molders in the United States. He may have made some newspaper reporter swallow this statement, but the truth is that he is not half a molder. He is one of those workmen whom it pays nobody to employ, because, instead of paying attention to their own business, they are all the time trying to break into some one else's.

There are a lot of people in all trades who imagine that theirs is the only one that is loaded with hard work and no opportunities. We have known of molders inventing machines that were of no earthly use, and of

machinists who attempted to improve foundry practice in a way that was really going backward. If each one had concentrated his attention and thought upon his own work there would at least have been a chance for an improvement to be made, but this thing of changing berths among mechanics does no one any good.

The best and most experienced molders stick to molding. The very fact that they have got experience makes them worth more as molders than as anything else. When a man begins a trade his success depends on sticking to that trade. More than half of the medium and poor workmen we have are jumping jacks, who are unable to understand that all vocations are full of hard work and lots of it at that, and that to reach the top in any calling no soft berths can be occupied.

Some workmen will say that they cannot confine themselves to a trade, because there is a tiring sameness about it. In the molders' trade and a great many others this is not so. A workman can seek recreation in his own trade. Lot of little inexpensive experiments can be made that will promote a love for his trade by the real workman, who must ultimately feel that his trade is one-half of himself. If a molder would learn to make drawings of the work he is doing or intends to do, his time would be far better occupied than in trying to do his brother machinist's work. If he would learn how iron is melted and the principles underlying cupola practice in general, he would be better off than he is trying to solve perpetual motion.

It is human nature, and always will be, for people to leave a trade as soon as they secure a few months acquaintance with it, and look for an easier one, but the fact is there just the same, that such do never attain the positions which only perseverance and the sticking to one thing can procure.

---

### The Machine and the Molder.

This journal has always contended that the intelligent portion of the molders, the largest part, in the Union and out of it, have always regarded the molding machine as it should be, in line with other machinery that has appeared. Molding machines generally do the more tedious and tiresome part of molding, and there is no more valid reason to object against the ramming of a mold by a machine than there is against carrying iron by means of a trolley track.

It has been advertised many times that molding machines could be operated by common laborers. As far as the mere operation of the machine is concerned this may be true, but even in machine molding the machine does not do everything. We have always contended that a proficient molder would turn out better work on a machine than the laborer, and enough better work at that to more than compensate the employer for his higher rate of wages. Taking it for granted that a molding machine is practical—which some, by the way, are not—we believe many a foundry who have installed these could have saved themselves from the making of a large amount of scrap and obtained far better success with their machines by employing more skillful labor to operate them.

At the Indianapolis convention of the Iron Molders' Union the subject of molding machines was taken up and disposed of in a manner that reflects the utmost credit upon that great labor organization. The molders treated the machine question in a sensible way, and this was undoubtedly largely due to the sound judgment of President Martin Fox, who in his report to the convention said:

"In these closing years of the century one cannot review the long list of evidences of man's inventiveness and skill without a feeling of wonder and admiration. The impossible seems in every field to have been accomplished. The forces of nature have one by one been harnessed for man's use and the gratification of his wants. Handicrafts that once insured the handicraftsman a living have been swept away, and the machine, that neither eats nor sleeps, has taken their places. No handicraft, no trade, is free from danger from this invader. One by one we have seen the domain of the mechanic invaded and his skill rendered valueless. Even those who felt the most secure have fallen the readiest victims. The iron molder for years congratulated himself that little danger was to be feared from the machine in his trade, but, like the many before him, he is slowly awakening to his mistake.

"The advent of the labor-saving machine in the foundry was the signal for an outburst of ridicule and contempt; they were to be laughed out of court; molders refused to have anything to do with them; they were a failure already. But they have outlived that stage of their history, and are to-day a more perplexing problem with which to grap-

ple than ever before. They were relegated at first to the unskilled laborer. To-day that laborer has become a serious rival of the mechanic in many subdivisions of our trade.

"Machines have developed from the simple 'squeezer' to the more pretentious stripping plate and 'squeezer' of later design, and, while in some branches of the trade their introduction would not be a paying investment, in others they are a problem which must be met speedily and intelligently. I feel that this convention will agree that this is the case, and that the policy of detraction and opposition must be forever abandoned. It is a truth that all history can be brought to prove, that if a labor-saving machine have merit, no opposition that the laborer can bring to bear will prevent its introduction.

"I strongly advise, then, that our members agree to work on those machines and bring out their best possibilities, providing satisfactory arrangements can be made as to wages. The mistake was made at the beginning, when our members refused to work on them, but we should be guided by our experience, and without further delay adopt such a policy as will give to our members the control of the machine and retain to them the trade which they have spent the best years of their lives in acquiring. I strongly recommend, therefore, that the incoming executive officers avail themselves of every opportunity that might present itself to further this policy, and that our members be urged to lend their assistance by sinking all old-time prejudice and making the effort to control the machine that will otherwise control them."

As a direct result of the president's report a committee was appointed to consider the best way of meeting the new condition of affairs. The following report was made:

"In our estimation, no more important question has been raised at this convention than that upon which we are required to give advice. While trades were being revolutionized by the inventiveness and genius of man, and those who were wont to depend upon their skill as handicraftsmen as a means of earning a living, were being forced to give way before the machine that neither tired nor complained, the iron molder for long seemed to enjoy immunity, and he fondly hoped that his skill could not be duplicated by the machine of wood or iron.

"The machine came, however, and was met with ridicule and contempt of the molder. It was a failure already, he said, and refused to give it a trial, or, in some instances, to allow it into the shop with him. But the machine would not down, and although it was forced to depend upon the unskilled laborer to bring out its best possibilities, it made headway, though for a long time slowly, and to-day as a result of our near-sighted policy of the past, that unskilled laborer and the machine we have ridiculed have so far invaded our rightful domain that, as men of intelligence, we can not afford longer to ignore them, but, if we are truly and intelligently alive to our future interests and necessities, we must now consider how best to minimize the future danger and how to repair the injury done by our grievous mistakes of the past.

"Had our members not refused to work with the machine and retained control of it, this problem would not be confronting us today. In the opinion of your committee the Iron Molders' Union must have jurisdiction over the operator of the machine if it is to be able in the future to furnish the iron molder with the protection he is entitled to.

"In that opinion your committee are all agreed, but we feel that with the brief consideration that can be given the problem at this late day in the session, we cannot do more than indicate our future general policy and leave it for further deliberation to formulate a plan by which it can be put into successful operation. We, therefore, submit to you the following resolutions, and ask that you bring to bear upon them the best and most intelligent consideration you can command:

"We, the delegates to the Twenty-first Session of the Iron Molders' Union of North America, in convention assembled, being fully alive to the dangers with which we are confronted, and realizing that the machine in our trade has become an established feature of it, and that it is now a serious competitor with the molder in the prosecution of his trade, deem it in the best interests of our members to sink all antiquated prejudices and to meet the problem as it now presents itself without further delay; therefore, be it

"Resolved—First—That it be accepted as the future policy of the Iron Molders' Union of North America that we shall seek to establish our jurisdiction over the molding-machine operator and all those who work at molding in the numerous subdivisions into which the specialization of our trade has divided it.

"Second—That we advise and instruct our members to accept jobs upon any molding machine when the opportunity is afforded and to endeavor to bring out its best possibilities.

"Third—And further, believing that the plan whereby the policy of the I. M. U. of N. A. as thus outlined, requires longer and more careful consideration than your committee can give it at this stage of the proceedings of this convention, it shall be the duty of our incoming officers and executive board to meet at as early a date as is practicable after the adjournment of this convention to discuss the matter and formulate a plan by which these resolutions can be put into effect; and it shall be the duty thereafter of our officers to bring the question before the various foundrymen or foundrymen's associations with a view to securing

their co-operation in promoting the policy herein outlined."

Treating of this subject the Journal says:

"We are not disposed to criticise too severely those who adhere to the old policy of antagonism, but is it now demonstrated on every hand that opposition to the machine is a losing game? Are we blind to the lessons of history? Are we to close our eyes to the fact that, despite the hue and cry raised by the stagedrivers and weavers, the steam engine and the loom came to stay, and have been developed beyond the wildest dream of the inventors?

"We need not go back to the beginning of the dying century for an illustration. Within our own memory we can easily recall the time when the printer laughed at the idea of his skill being duplicated by the machine; but we see what the linotype has done. Coming nearer home, have we not seen the old 'squeezer' introduced, and, in many cases, discarded? The man with the rammers could outdo it. But it was not always to be so, and, deceive ourselves as we may, the fact stares us in the face that the machine in the foundry is making progress, and, if indications go for anything, will make still greater progress in the immediate future.

"That being the case, a policy of uncompromising antagonism would be simply suicide. We cannot afford to allow ourselves to be governed by antiquated notions about our mechanical skill, and our right to protect it against usurpation by the machine. No efforts that we can put forth in that direction will avail to keep it out of the foundry. Its progress will be determined by its degree of success, and not by the degree of antagonism on the part of the molder.

"Many of us seem to be imbued with a false pride regarding our reputations as mechanics. Thus we have heard within the past few weeks of some of our members quitting a shop rather than go to work upon a 'squeezer.' And yet the machine in the case did nothing more than do away with the hand ramming; otherwise the skill of the mechanic was just as essential as ever it was to good work. What will result from such obtuseness? Just what has resulted time and again under our very eyes—the employer will not go to the molder when he wants an operator, but will go to some bright, active, young laborer, give him a small inducement to operate the machine, and, in a very short time, the molder will not get a chance to operate it, and it will run him out of the foundry. That is a truth bluntly stated. And, while it may not be pleasing to some of our readers, the sooner their eyes are opened to the truth the better it will be for themselves and their craft.

This is good sound sense preached right where it is needed, and it is all the more gratifying, because it comes right from the union itself, instead of emanating from others who would not have the same interest in its affairs.

## The Krank's Korner.

The conversation was about the big day's work that molders are turning out at the end of the nineteenth century. First one man and then another would produce records to show that this town and that town had the largest "slaughter house." When I left it was with the opinion that people didn't work very hard, except for the last few years.

Someone told a story of a molder at Erie, Pa., who was seen to leave the shop one evening about five o'clock. It is something out of the usual to quit that early in the foundries of Pennsylvania and especially in Erie, so one of the surprised citizens asked Mr. Molder how it came about that he was released so early in the day. "Had a light heat to-day," replied the molder, "and a good job." "How much iron did you have?" asked the citizen. And this was the molder's answer: "Only thirty-eight handladles."

* * *

Of course we are turning out more work to-day, but are we working any harder? We think that the foundrymen of fifty years ago had a soft snap and I will bet our successors in 1999 will have the same opinion of us. What we are doing to-day will probably not look so hot a hundred years hence.

I can't remember as far back as some people, but as long as my memory reaches towards the rear, people who have earned their living in the foundries have had to sweat more or less, mostly a whole lot. It requires a certain amount of physical exercise to hold a job in a foundry and if this exercise produces more work than before, it is probably because it is better applied. We have learned to use our energy to a better advantage. We waste less leg power. And those who follow will improve on us just as we have done on others.

* * *

While we have got the big day's work in mind, let us investigate who it is that are piling up records.

The big day's work is without reservation produced in the specialty shops. It is true that some "whoppers" are found occasionally outside of these places, but such stray mavericks only represent exceptional individual capacity and not the run of the mine.

The jobbing shop may have some day's work set by the "Home Guards" that are tough for a stranger to tackle, but it is in the radiator, malleable, car, agricultural and I believe I am justified in saying the stove foundries, where a molder's endurance must be something akin to that of the victor in a six-day bicycle race.

* * *

Right here it is curious to note that those who work the hardest with their hands work the least with their heads. Put a Polock in a car shop and a negro in a plow shop and you have a combination that is hard to beat. They will work early and late. They have an incredible supply of power stored up—but they must have someone who can show them how to use it.

All of the so-called cheap labor lack the ability to direct its own efforts. It is scrap and you must supply the scrap carrying element in the form of competent foremen. Low priced labor lacks the intelligence to direct its own efforts. The mind of low paid persons travels only in the groove shown by others. In every community there is more or less of the "bottom of humanity" which must be utilized somehow in the form of cheap labor. To train this element so that it becomes money-making equipment, requires far more tact than is commonly supposed.

* * *

In reviewing the life of a prominent foundryman, his biographer says: "He was in the most eminent degree a successful man. There are people who deem no man successful except he accumulate for himself a fortune. Measured by this groveling standard his life was a dismal failure. He labored hard all his life long and died poor."

This is cheerful news for the coming generation. It is no good for the present day. Perhaps there will come a day when a man can become eminently successful just by dying poor. There will be plenty of successful foundrymen than if the stock of poor ones hold out.

Serlously I fail to see what benefit anyone can derive from a biography which greases everything it comes to, especially if the party whom it concerns is dead. A successful man does not die poor. When he becomes poor he ceases to be successful. I know a lot of men are considered smart and clever, who never have a cent to their name, but I do not consider them successful, because they lack business talent to turn their knowledge to their own advantage.

* * *

Business ability is as much needed to carry an industrial enterprise to a successful issue as mechanical skill. I know workmen are liable to scoff at the office force as needless parasites who produce nothing. Yet these same workmen, who may be the best mechanics in the world, fail utterly when they start in business for themselves.

There are a great many successful foundrymen who never worked at molding in their life, and there are an equal number of good hard working molders carrying on a business of their own who are anything but successful. Success means the ability of a man to turn his knowledge, mechanical or otherwise, into coin. What profit it a man to be even so perfect at his trade if he can not render this of service to himself?

* * *

I read an article the other day on casting wrought iron. I read it as much as a dozen times. The more I read it the stronger became my conviction that all fools are not by any means dead.

It always appeared to me to be a waste of time to tell hair raising stories to bald headed people. What is the use of giving practical foundrymen a lot of guffgaw about melting wrought iron?

Some foundrymen, who are not practical, are always interested in such schemes as melting steel in an ordinary cupola and casting it without any more ado, melting wrought iron and other metallurgical processes depending upon ignorance to push them along.

* * *

I do not deny but what wrought iron can be melted and cast. It is possible, but not practical. In the first place the cost is against producing this kind of castings. In the second place these do not equal wrought iron in quality. The cost of crucibles alone is enormous, and melting in crucibles is the only method not a complete failure, as owing to the high temperature to which the metal must be raised, these last but for a few heats. Then there is the cost of fuel, oil or gas being the only ones suitable for the purpose. No sane man would under such circumstances attempt to produce an inferior grade of wrought iron castings of

uncertain qualities and claim to be able to run more than an experimental and non-paying business. Seriously Mr. Reader, when you consider how perfect drop forging has become and the surprisingly low cost of the product by this method do you not wonder that anyone should have the audacity to suggest that melting a few pounds of wrought iron in a crucible with the aid of expensive fuel could in any way be considered an improvement?

* * *

"Do You Know" set a number of times in italics attracted my attention to an article. It was a sort of a display advertisement and of the wares offered for sale I want to speak.

Here is one of the curiosities that followed an italic "Do You Know": "that you can make a vent hole straight through a core or any other body of sand, if the wire can be started straight, by using the rifle-ball principle, that is, by revolving the wire slowly as it passes through the sand, the deviation from a straight line when in one position being counteracted by an opposite deviation when a half turn has been made—the very principle on which rifle balls are made to travel straight, although having a constant tendency to move in a curved line."

* * *

That kind of literature makes me think the foundry business is getting elevated all right enough.

I know thousands of cores are made every hour, but I doubt if there is a single coremaker who is aware he is using the "rifle ball principle" in making them.

I would like to see a coremaker "revolve the wire slowly as it passes through the sand," all the while keeping in mind that the deviation from a straight line on one side of the wire is counteracted by an opposite deviation on the other side. * * * * Some of these mechanical yarns make me laugh. If a coremaker had to practice this "rifle ball principle" he wouldn't earn enough to keep him in tobacco.

* * *

There are a great many things a man is better off for not knowing. This is one of them.

If the "rifle ball principle" must be employed in venting cores, I would respectfully suggest that when the core is ready to vent, an expert marksman be employed to perforate it. That would carry the principle out to the letter, and there could be but very little excuse for deviation.

* * *

At a meeting of a foundrymen's association recently, one of the speakers complained of much trouble with machinery castings caused by "casting strains." He cited his experience with a crosshead made from cast steel which upon being annealed and relieved of the strains due to unequal contraction and not to "casting" tended to verify his conclusions. As the subject under discussion was the behavior of cast iron and not cast steel it would be interesting to know what relation this side issue had to the main question.

* * *

Then there was another speaker who converted himself for the time being into a prophet and predicted that inside of ten years, steel would be employed exclusively for machinery castings, while the use of cast iron would be confined to floor plates, sash weights and the like.

Cheerful news, sure enough, but then the same thing has been heard before. I don't know how it is that otherwise sensible fellows should become inclined to make such statements. I can only account for it by supposing they eat some peculiar food which affects their power of imagination.

Cast steel, even if it were possible to produce it at the same cost as cast iron, still lacks many of the qualities which make cast iron the favorite metal. There has been process after process invented calculated to make the casting of steel an easy matter of accomplishment and yet we continue to use a greater amount of cast iron than ever. Would this be so if there was any indication of iron founding going out of existence before the end of the next decade?

* * *

"Mechanically, the plant at Edison, N. J., is a wonder; commercially, it cannot be seriously considered as a factor in the ore situation."—The Iron Trade Review.

There is more truth than poetry in that sentence. Sentiment and business seldom go hand in hand. Whenever a new discovery has been made someone has been ready to predict a complete revolution of existing conditions. When the Edison Company built its two million dollar plant for the concentration of the low grade ores of New Jersey somebody thought it was about time for the

Lake Superior mines to close up. It is hard to beat mother nature with something artificial however. There is no doubt but that the New Jersey ores can be utilized, but that this will seriously affect the output of other properties is out of the question. Meanwhile we ought to be thankful for what relief we can get from this source just now.

* * *

In spite of all that is said about the decadence of the use of charcoal iron it is curious to note that whenever some important job of exceptional note looms up, the specifications say that altogether or in part, the castings must be made from charcoal iron. Against all the technical discussions denying the superiority of charcoal iron, practical foundrymen still grant it first place and furnish it when the customer is willing to pay the price, as many find it economy to do.

---

A new alloy, patented by R. T. Roman, of London, consists of copper 86 parts by weight, nickel 3 parts, tungsten 1 part and aluminum 10 parts, or slight variations of the same. The copper and nickel are first melted together, and the tungsten, wrapped up in aluminum cartridges, is pushed into the alloy, which is then granulated in water. The shots are dried and remelted under a mixture of borax and fluor spar, when the required quantity of aluminum is added. The alloy is poured into chilled ingot molds, melted again and cast into the required shapes in sand or other molds.—Aluminum World.

---

That the time has not entirely passed when the proprietors of a foundry roll up their sleeves and get a few pointers themselves is shown by the following item from the Troy (N. Y.) Record, relating to the Bennett-Chalou Foundry Company of that city:

"The firm will this week turn out a five-ton casting. The flask in which it will be molded weighs three tons, and is so large that it is necessary to widen the doors to get it into the foundry. Two members of the firm will do the molding."

---

The Journal of Finance, New York, a short time ago contained the following item:

"It is rumored that a number of prominent iron men are negotiating for the establishment of a new pipe foundry in Milwaukee to fight the recently formed pipe trust, which absorbed the soil pipe plants of the Rundle-Spence and the Hoffman-Billings-Weller Companies.

An iron founder says that the promising condition of the iron market, and the formation of the soil pipe trust, which, it is believed, will try to raise prices, are acting as a stimulus upon the business, and that iron men all over the country are looking forward to unprecedented activity in their plants. He believes that a great deal of capital will be invested in new plants and for the enlargement of old ones within the next few years, and that any new foundry started now is almost certain to become a profitable business."

Any new foundry will surely not become a profitable business unless located and managed right, right all the way through, too.

---

### Trouble With a Piston.

Editor The Foundry:

I have read Mr. L. C. Jewett's reply to my small and trifling response to his "invitation to others" for their opinion concerning this historical trouble with a piston, which appeared in the February number of this year. He seems to be a little alarmed as to whether I am a chemist or a molder, but what about this, it matters but little to most people where their information comes from so long as it is sound, solid and sensible, and if it be that Mr. Jewett is a molder, I can well imagine his chagrin at being defeated by the chemist.

At the close of his article with regard to chemistry and the part it is playing in up-to-date foundry practice, it is altogether irrelevant to the point at issue; as I understand the chemist was simply asked for his opinion with regard to the defective parts that were appearing at the turning out of those grooves in the piston, just in the same way as Mr. Jewett, only with this difference, that the chemist struck the true solution of the problem.

Take those brackets away and you may rest assured that you will have no more trouble with pistons. But, I dare say, these are adjuncts not likely to be dispensed with, therefore you have an absolute cure in placing a core in those grooves, giving the usual allowance for turning. Mr. Jewett's reference to steam cylinders and gear wheels that have ribs and braces radiating from the outer plate or ring of metal, has given me proof that the subject of "metal draw" or disintegration has not yet began to dawn upon him, as the parts referred to in those castings are internally weakened through having those brackets and attachments, but

just as with the piston, they are hidden until, by some accident or otherwise, they become exposed, and had Mr. Jewett any experience with hydraulically tested castings he would not have made such reference. Brackets and projections of any kind have become discarded by many of our best engineers on account of the trouble they give through sponginess about the fillets showing themselves while being tested.

Mr. Jewett seems to be greatly surprised that of two 26-inch pistons, cast at the same time, there should be one good and one bad. To my mind there is nothing extraordinary or phenominal about it, because it is what is happening every day. How often does it occur that two or more test bars are cast from the same ladle, each giving different results, and many other common castings I need not mention.

I admit that there were other conditions with the job that I did not mention such as "the opinion still being prevalent in that foundry," that their losses had been due to "shrinky iron." The only excuse that I can give for this or any of the other "conditions" mentioned by Mr. Jewett is the elementary nature of the whole question, and as I hold to the opinion of the shop and the chemist being right, I do not expect to be able to alter the opinion of any man so minded as Mr. Jewett because "A man convinced against his will is of the same opinion still."

Further, it is no part of the chemist's duties to accept responsibility for defective parts in castings that are "drawn" through variation of shrinkage, and the molder who thinks he is able to hide himself behind such slender argument is only showing gross ignorance and a want of capacity to grasp what may not inaptly be called an everyday occurrence, for it is only too true that there are to be found castings in abundance which, if probed by machinery similar to this piston, would undoubtedly be consigned to the scrap heap in short order.

W. ROXBURGH.

## A New Alloy.

While experimenting for a metal to fill certain requirements Prof. W. F. Durand of Sibley College, Cornell University, Ithaca, N. Y., made some tests of an alloy composed of two-thirds aluminum and one-third zinc, which he has given the name of "Alzine" from its two constituents. The principal properties of the metal may be noted from the following figures:

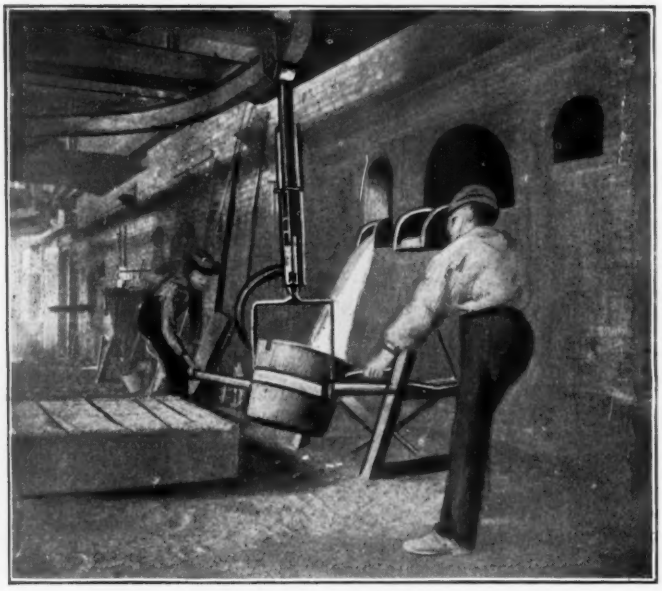
| | |
|---|---|
| Tensile strength deduced from small bars | 22,000 |
| Maximum fiber stress deduced from transverse tests | 44,000 |
| Modulus of elasticity | 8,000,000 |
| Specific gravity | 3.3 |

The color is white and it takes a fine smooth finish and does not readily oxidize. It melts at a dull red heat or slightly below, probably about 800-900 F. It can, therefore be readily melted in an iron ladle over an ordinary blacksmith's forge or other open fire. It is very fluid and runs freely to the extremities of the mold, filling perfectly small or thin parts. In this particular it is much superior to brass. It is, however, desirable, for solidity of casting, to pour the metal at as low a temperature as will enable it to properly fill the mold. It does not burn the sand into the casting and hence comes out clean and in good condition to work. It is rather softer and more easily worked than ordinary brass, and yet is not as liable to clog a file. For equal volumes and with aluminum at 40 cents per pound, it is about equal in expense to brass bought at 12 cents per pound.

This alloy would seem to be admirably adapted to many small parts of machines, models, etc., where lightness combined with good finish, strength, stiffness and non-corrosiveness, are among the desiderata.

## Pickling Brass Castings.

Some time ago a correspondent of the American Machinist asked for general information on the process of pickling brass castings, such as oil cups, pump boxes, injectors, etc., to which Mr. Abram Ammerman, superintendent of the Jackson Architectural Iron Works, of New York, replied that the mixture used at that establishment is: Two parts by measure of nitric acid, and three parts sulphuric acid, with a handful of table salt to each quart and no water. The pickle may be held in any suitable receptacle, say, of glazed earthenware, or a vitrified bath-tub might do, although it is only necessary to provide a vessel large enough for the immersion of the largest piece to be



TROLLEY TRACKS—AT THE CUPOLA.

handled. The pieces are simply dipped in and removed at once and rinsed in clear water. This is merely for cleaning and brightening the castings. Various dips are used for giving different colors.

### Trolley Tracks.

Talking about trolley systems in the foundry, I would like to say a few words in favor of Mr. Ramp's articles that appeared in The Foundry some time ago. As the

TROLLEY TRACKS—ON THE FLOORS.

foundry business is improving, and the old shops are increasing their capacity and putting up new additions, if they only knew what a help and money-saver overhead tracks are they would largely use this system. I have tried gangway tracks and pushing bull ladles on iron plate floors, but the trolley system is as far ahead of any other as the electric car is ahead of the "one horse shay."

We are using two systems, one in our gray iron foundry of I beams, and the other in the malleable foundry, made of ½ by 2-inch flat truck. They are both good but the one in the malleable shop costs the most for repairs, as the wheels wear out more or less. The other one in the gray iron foundry has not cost one cent for repairs since it was put in six years ago.

Our foundries are 100x350 feet and have two gangways six feet wide. In the gray iron shop we take the iron from the mixing ladle and deliver it anywhere in the shop along the gangways, or run it on to a traveling crane, of which we have four running from the walls to the gangways. With three 800 pound ladles we can take the iron away faster than our 48-inch cupola will melt it.

We carry all our castings out into the rattler room in boxes hung from the trolleys, when one man can do 50 per cent more work than he could with a wheel-barrow.

In the malleable department we take the iron from the furnace spout and pour it right into the molds, that is our heavy work, one ladle pouring three couplers. We have a spring hook on the trolley so that we can raise the ladle as it is being emptied and the iron will not have such a high fall when the ladle is full.

As Mr. Ramp says, there is no machine about a foundry that can demand better claims to being a dollar and labor-saving machine. The advantages are great and its good points many and we should not want to get along without it.

TROLLEY TRACKS—POURING.

JOHN GUNTHER,
Foreman Gray Iron Dept.,
Walter A. Wood Harvester Co.,
St. Paul, Minn.

### Moving a Cupola.

We show herewith an illustration of a job recently done at the Kansas State Agricultural College, of which Jos. D. Harper, superintendent of shops, writes:

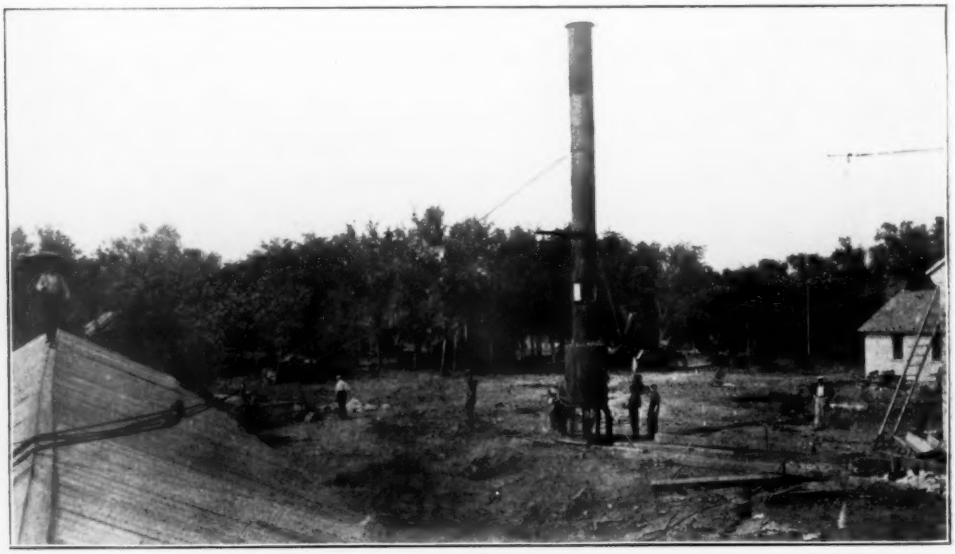
"This cupola was moved about three hundred feet to the site of the new foundry without removing the lining and without any trouble whatever. We had read in THE

FOUNDRY about somebody else doing it, and found it such an easy job that it is hardly worth while to write about it.

"Our foundry product is lathe beds of several kinds for the machines we build in the shop, sensitive drills, small gasoline and steam engine castings, and in fact almost anything that comes our way. We make from two to three heats per week, running about one and a half tons each time."

This college appears to have solved the foundry question in a practical way.

Instead of hanging up several pictures of a foundry, or at most, melting a few pounds of lead for the edification of visitors and students, the Kansas institution makes whatever small castings that come along.



MOVING A CUPOLA.

Running three heats a week is pretty good showing for a college foundry. It should be noted, too that the class of work made is such as offers the student a continual change and a chance to show his ability and advancement in new directions.

### The Movement is Gaining.

Some time ago there was organized the National Founders' Association which has for its object the settling of all disputes which may arise between its members and members of the Iron Molders' International Union of North America.

Whenever a new movement of this kind is started its ultimate success is generally open to doubt. The National Founders' Association has however passed its initial stage and proven itself of benefit to both employers and employees. We should not have referred to this association at the present time but for the fact that a similar movement is starting in Great Britain. The 540th monthly report of the Friendly Society of Iron Founders of England, Ireland and Wales contains an editorial article on "Disputes and Their Settlements," which we deem worthy of reproduction, because it shows that workmen and their employers are unconsciously coming together for mutual advantage. What is said in the article in question may, word for word, be applied to the American workmen and employers. It is as follows:

"Events that have recently transpired between ourselves and our employers tend to show that the old system of settling disputes is fast becoming obsolete, and that in the future we shall not be able to deal with our employers individually, but shall have to meet them collectively, acting through their committee or executive council. In recent cases when an appeal for an advance of wages has been made by our members, the society has been asked by the employers to be represented by some one connected with the general office; we have acceded to their request, but always with the proviso that there should be representatives from the branch or branches where the grievance exists. By adopting this course, we have been able in most cases to secure the demands of our members, so far as they have

been justified by reason and fairness. As this system of settling disputes will become more common in the future, it is as well that we should recognize the fact and be prepared to meet the employers with statements and facts that will help to substantiate our claims.

"In order to help our representatives to meet the employers with success, it is necessary that our claims should be carefully considered before being put before them, so that we may have a reasonable chance of bringing about a successful settlement. Now with reference to this method of settling disputes, we are strongly of opinion that it is preferable to the old method of dealing with employers individually; in the first place, we have a fairly representative body of the employers, who are more likely to be influenced by what is placed before them, than would be the case if we had to deal with them separately. Again, we have a recognition of the society as an important factor in any settlement that may be arrived at. This is a considerable advance on the time when the employers refused to recognize the society in its official capacity, and preferred to deal direct with their own workmen. In acceding to this method of settling disputes, we are not in any way sacrificing our rights, or binding ourselves to any settlement or agreement that may have been arrived at between the employers and other sections of their workmen. On all questions we claim the right to act in the interests of our members, without prejudice from any settlement that may have been arrived at by men in other trades.

"Whether the above method meets with the approval of our members we are not in a position to say, but it is absolutely certain that, now the employers are organizing, it will have to be faced, and our action in connection with the settlement of the first disputes under the new method will have a lasting effect on our future success. Up to the present we are bound to state that when we have met the employers in conference, we almost invariably found them courteous and respectful towards us, and have always shown a disposition to listen to reason. Whether this will be so when trade declines and the demand for our labor is lessened remains to be seen, but in order to be prepared to meet those times when they arrive, it is necessary that we should co-operate with those Federated Employers in such a manner, that we can be prepared to resist any unjust demands that may be made from their side.

"The greatest complaint on the part of employers at present is, that many of our members do not work so regularly as could be wished, and so cause them great inconvenience in fulfilling their contracts. Whether this evil is so great as the employers assert, may be open to question, but we know that there are some of our members who lose an unreasonable amount of time, and whose action will hamper us in the future if it is not stopped, and we appeal to our officers and members, where this kind of thing occurs, to do all that is possible to put a stop to it. We have no power to fine such men otherwise than by stopping their benefit, and we hope the rule in this respect will be rigorously enforced, so that this ground of complaint on the part of the employers may be removed.

"On the whole, we think we may safely say that this method of settling disputes will prove eventually to benefit both employers and employed, by preventing strikes on unreasonable grounds, and also act as a deterent to unscrupulous employers who might show a disposition to take advantage of their workmen by enforcing upon them unjust and unfair demands."

# CAST IRON NOTES.

**Devoted to Inquiries from Practical Foundrymen on the subject of Melting and using Cast Iron. Address all Inquiries to W. J. KEEP, care of The Foundry.**

### PECULIAR KIND OF BLOW HOLES AND THEIR CURE.

"The blow holes occur in small cast iron shells weighing about 40 pounds, and which are 14 or 16 inches long, and 4¼ inches in diameter. They are cast on end, and the vent is taken off through a small gas pipe on which the core is formed. The cores are made with boiled linseed oil, just as small a quantity as can be used and have the cores stand the strain of being straightened on the pipe. The iron is required to have a tensile strength of 23,000 pounds per square inch in a turned test piece. A good quality of clean scrap is used with No. 2 pig iron, and some steel turnings are mixed in the ladle with the melted iron. The turnings are generally clean, but have more or less salsoda or soap on them from the machine shop. The castings have a good many blowholes under the skin, and often in any other part of the casting. A blowhole, however small and ⅛ inch deep, condemns the casting, and at least one-fourth of the production is condemned for this cause. The castings have been poured both hot and cold with no appreciable difference in this respect. Some suggestion is asked that will enable the production of sound castings."

Answer.—If the iron enters the mold from the bottom it would be well to set a riser on top and allow some iron to flow through

the mold so as to move the holes from the surfaces of the casting.

By pouring the iron hot the bubbles of gas can rise and reach the top, while with dull iron they would be caught in the body of the casting.

By making the gate so that the iron will enter the mold at the bottom the gate may be shaped so as to give the iron a whirl in the mold and the blowholes would work to the center and might disappear altogether.

The trouble in this case seems to be caused by the steel turnings that are mixed in the ladle with the melted iron. The melting point of steel is higher than that of cast iron, therefore steel turnings are not likely to be melted in a ladle when mixed with melted cast iron. The instant that a particle of steel is brought near the fluid iron its surface becomes covered with an oxide. This oxide produces a gas when the casting cools which is very likely to form a blowhole.

The turnings of steel do not melt so as to form a perfect chemical union with the cast iron, but is mechanically mixed and is likely to cause trouble at any time. When a high tensile strength is required the addition of steel scrap will give the strength if it comes near enough to being melted to mix generally through the mass. The steel scrap should be charged in the cupola along with the pig iron, and 10 or 15 per cent of steel scrap will be beneficial and help to meet the requirements regarding strength.

When steel borings or turnings are added in the ladle, they are sometimes not melted, but the oxide-covered particles of steel will be carried along with the fluid iron and enter the mold and be caught in the mass of the casting. In such case each little piece will be very likely to form a blowhole.

In pouring cast iron, if the iron strikes the bottom of the mold so as to splash, the little drops will be instantly covered with an oxide, and when the fluid iron covers them a blowhole will form around the little piece which will lie loosely in the hole.

Even when steel chips are charged in the cupola, often particles covered with oxide will not melt, and as a consequence a casting will sometimes be honeycombed with blowholes and loose grains.

The best way to melt very fine chips of cast iron or of steel is to spread them on the sand bottom of the cupola before the kindling is put in, and they will be heated nearly to melting by the fire, and will be covered with the melted iron that accumulates before the first iron is drawn off.

Adding steel scrap to melted cast iron reduces the percentage of carbon, which change makes the melted iron less fluid. It is very difficult to make melted steel hot enough to fill a mold, and the addition of 10 or 15 per cent of steel scrap in the cupola lowers the carbon percentage of cast iron enough to materially lessen the fluidity of the iron. The less fluid the iron the more blowholes in the casting, because gas cannot rise freely to the top and escape through the porous walls of the mold.

When castings are made of steel alone, small pieces of high silicon pig iron are added to make the metal more fluid. A little aluminum added to the ladle will so increase the fluidity of the metal as to allow the gases to escape and perfectly solid castings will result.

Probably in the present case the best way out of the trouble is to add somewhat less than one-tenth of one per cent of aluminum in the ladle and pour the metal hot. Some small pieces of ferrosilicon may do the same thing.

The metal is made so fluid by the aluminum that the impurities will rise and the gases will escape through the mold, or perhaps the gases are prevented from separating from the melted iron. If steel scrap is added to the cupola, increase the coke a little, because it takes more fuel to melt steel than pig iron, and because iron containing steel must be hotter to run, and it should be fluid enough to let the gases get out.

With these suggestions I think there will be no further trouble, and I shall be very glad to hear of the results.

---

### Some Ways of Working a Molder Should Know.

In rolling over drags, though a comparatively simple operation in small work in a jobbing foundry, when handling a variety of the larger classes of work, the workman will find use for much care and ingenuity in doing this neatly and successfully.

In rolling over large drags by hand, if too heavy for the number of men employed, a

great advantage is obtained by a judicious use of props to take the weight, under a central batten, at two or three points, both when raising and lowering. A common bottom board 18 inches by 3 feet, or a foundry trestle will give all the variety of heights wanted in any ordinary case by changing the position of the prop, and its position under the batten.

This device gives the men a chance to take more favorable holds; they can do the work much easier, and with much less danger from accident, either to men or mold.

The prop acts not only as an assistant to the men, but the security against harm which it gives, makes them more confident, and induces them to stand up to their work instead of shirking for their own safety. Considerations of safety admonishes us that the prop should be handled with promptness and judgment, which suggests that one person, say the foreman of the shop, should attend to same, as a little mistake in the angle may cause trouble.

The work will be better done after some practice, and what is of more consequence the confidence of the men, with regard to safety, will be well secured.

When large, wide drags are to be rolled, if the boards are not strong and well clamped the sand will settle, when on edge, from its great weight, sometimes seriously damaging both mold and pattern? A cubic foot of rammed sand weighs 95 pounds.

A good remedy and often practical as a substitute for stronger fixtures, is a board or plate rammed up edgewise in the center of drag sand, with brace sticks, or clamps, reaching to and bearing hard against the lower side of drag, to take the weight of the upper half of drag sand, when on edge.

When rolling over large plates, etc., with flanges or other projections, there is an advantage in having the flange on the lower side, as the flange will be packed tighter rather than loosened, as it will be, generally, when on the upper side.

If, however, there is difficulty in drawing such a pattern, and it is important to have it draw easier, rolling with the flange upward will give great relief, but its liability to thicken the flange should be taken into account.

The molder often finds his room very cramped for rolling over, through the sand heap being in his way. Much sand shoveling and flask dragging can be avoided by ramming up the drag where it is wanted to stand when rolled; before rolling place a block with a small top surface—a cast iron "bull's-eye" an inch thick, molded and cast in 2½ minutes is the best—in such a position that the drag will balance on it when on edge, by swinging the drag half way around, the block forming a pivot, the drag will roll back on the same bed.

If the sand heap is still in the way, roll in the same manner on the end of drag, which will not turn the drag "end for end," as does side rolling; an afterthought about the convenient position of a pouring gate, etc., may be carried out by choosing between these two methods.

Clamps for rolling should, in many cases, lean, or be drawn in opposite directions. When rolling a drag there is a strong tendency of the follow-board to slide as it approaches the perpendicular. After passing the center the load is in the same position in relation to the bottom board, with the same tendency to move that board, showing the necessity of setting the clamps to pull both ways. If one clamp only is used on the end it should be set straight as possible, and the wedges driven in an opposite direction to the way the drag is to be rolled, as the sliding force is greater on the bottom board, on account of the blow received when that board touches the ground after passing the center.

All rolling is easier and gives less twisting of the clamps, if center blocks are used from 2 to 4 inches high, according to the depth of drag.—R. D. Moore, in Iron Molders' Journal.

---

### An Upstairs Foundry.

At Pittsburg during the convention of the American Foundrymen's Association, Mr. C. J. Wolff, of the L. Wolff Manufacturing Co., Chicago, read a paper on what he considered the advantages of having a foundry on upper floors, in which he said:

I thought it might be found interesting to some of you to hear and know about an iron foundry melting 70 to 80 tons per day, with a clear molding floor of 125 feet by 540 feet long, located on the third floor.

The foundry, being above the house tops in the neighborhood, always has unobstruct-

ed light, and the air is so pure that in summer the birds seem to think it a nice place to perch on the beams of the roof construction and watch the molders, while singing their little songs to an appreciative audience.

The molders do not leave their work so frequently for refreshments, and are not disturbed by visiting friends and inquisitive strangers. The dampness arising from ground molding floors, which is often the cause of rheumatism and colds, is avoided.

The smoke and steam incident to starting the cupola and casting iron are quickly dissipated by the breeze that has unobstructed passage through the windows, and being so high above ground does not bother people living in the neighborhood; making it at all times a pleasant place to work in.

The building is of mill construction; the foundry floor consists first of a three-inch matched floor on the joists; above this is a coating of tar paper, then a cedar block pavement four inches high, bonded together and filled with tar and gravel, in the usual way you have seen them laid on our city streets. The molding sand covers this, the dampness of which is sufficient protection.

This forms the molding floor. The floor around the cupola is made of steel beams for joists, with brick arches between same; this is covered with an ash cement and makes a floor upon which the bottom of cupola can be dropped without any danger of fire.

The cupolas, of which there are two, are situated near one side of foundry at about equal distance from each other and from the ends of the building. The cupolas stand on foundations of brick, built up from the ground, which are used for vault purposes on the lower floor.

The charging floor or scaffold is of iron on steel beams, large enough to hold pig iron and coke for the day's melt, which is taken up in the forenoon, so when the blast is on, the charging is done with ease and dispatch.

The blowers are placed on the ground floor with the blast pipes running up to the cupolas. The jarring effect, caused by charging the cupola, and the vibrations of blowers, having no bearing on foundry floor, do not in the least jar the molding floors.

The foundry is built with clear story in the middle like most foundries are now put up. The roof is supported by steel truss work with a span of 60 feet in middle of transverse section, thus leaving 32 feet on each side of trussed section. The posts in foundry, supporting the trussed roof are of cast iron, and do not interfere with molding floors, as they are alongside of gangway. These iron posts also support an overhead "I" beam tram rail, on which the trolleys which carry the bull ladles travel, for distributing the molten iron to the molders throughout the foundry. This track system is so constructed that iron can be taken from one cupola to either extremity of the foundry. One man can with ease pull a ladle holding 800 pounds of iron.

This system of handling iron does not jar the floor. The steam elevators deliver pig iron and coke to the charging floors of cupolas, and the trip from ground floor to scaffold does not take much longer than to hoist material from ground to scaffold of cupola in foundry situated on ground floor. Iron and coke can be piled contiguous and easy of access to elevators.

The castings are taken down to cleaning room on a belt elevator on the opposite side of foundry. The molders put up their work in the morning and early afternoon, and after pouring off, they go home. A night gang shake out castings and wet down sand. When the molder comes to work in the morning his sand heap is ready for him, and the castings have all been taken away in hand trucks early in the morning; each truck holding the castings made by one molder. The castings are checked up on leaving foundry and again in cleaning room. There is a steam elevator back of each cupola and, one belt driven one. These three elevators take care of all castings, new molding sand, pig iron and coke, together with the needs of the departments on second and first floors.

There is a large range boiler and tank shop and machine shop and other works connected with the preparation of castings for enameling, on second floor. These departments are never troubled by dropping sand or smoke or steam from foundry, thus making this second floor as good for any use as if there were no foundry above it.

The first floor is used for finished stock, shipping room, rattle room and enameling shop. A basement at one end of the factory contains the supply of sand. There are no long hauls in disposing of castings from foundry; they simply need to be lowered,

which does not take much power. We make castings up to 800 pounds in weight, using a number of three-ton traveling cranes.

Incipient fires are very unusual, and we do not think our foundry at all dangerous. Our insurance rate for foundry is not increased by reason of our location.

We have a pattern house across a 16-foot alley connected with foundry by an iron bridge. We had a disastrous fire some years ago on a Christmas eve—its origin was unknown. Some heavy wooden truss work holding the roof spans contributed to the spread of the fire, together with a four-inch water main in the street, being wholly inadequate as a supply. The pattern house, which contained all our master and many working patterns, was not burned, which proved a blessing in our misfortune. In rebuilding we used iron roof construction and effected some other improvements, such as building two fire walls with iron doors, thus dividing the building into three sections, while making practically one large room.

Having started this style of foundry 18 years ago, as an experiment, much to the amusement of our neighboring foundry friends, we found it to have so many advantages that, when 12 years ago we needed a larger foundry, we built our present factory, and have since had many inquiries from people contemplating building new foundries, many of whom have followed our example.

Among the advantages we consider we have are, the great economy in ground covered, the protection against obnoxious and intrusive visitors, the inconvenience for the men to leave their work readily, and also the means afforded for better light and air.

## Some Pencil Sketches of Failures.

By PATRICK CONNELLY.

When once a habit is formed it is the most difficult thing to remove it or to make an impression upon the owner that it needs some alterations to make it perfect. In the average jobbing shop there are probably but few flasks but what have considerable play in their pins and connections. From sheer habit the molder has become so accustomed to yell at his partner, "Turn about," that it may not be easy to show that this action upon his part does not always result in preventing a shift. Turn about as a rule means to the left, each end of the cope being put on that way before ramming up.

The simple turn about, however, only provided against a shift in one direction, and I want to illustrate that all loose pins permit a flask to shift in two directions. In Fig. 1 we have a shifting flask, shown on a somewhat larger scale than we hope occurs in practice, in order to better illustrate the subject. The molder has said his "turn about," as the pins A B will show, both being held to the left. If the casting should show a shift he would be ready to swear that he didn't have nothing to do with it, wouldn't he? If he couldn't find some little play in

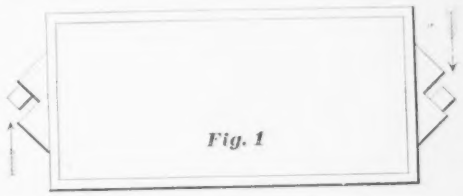


*Fig. 1*

the dowel pins of the pattern he would blame anything but himself. He forgets that closing a flask "turn about" only provides against a shift sideways. Now any box that will change its position sideways will also change its position lengthways, anything that is loose being capable of moving in more than one direction. This is illustrated at Fig. 2, where the pins A B occupy a different position to the drag from what they formerly did, and still they have been held "turn about" and are in such a position as will permit a true casting. Instead of saying "to your left" when closing

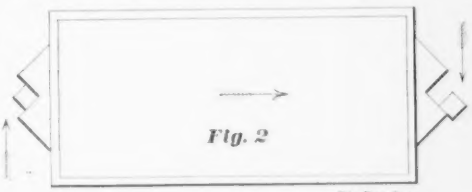


*Fig. 2*

*The Foundry*

a mold the molder should say, "To you and to your left;" this would provide against any possible chance of changing position. The arrows in the illustrations denote the direction in which prevention has been taken against shifting, those in Fig. 1 showing that provision has been made against a shift in but one direction, while Fig. 2 shows the box closed in such a manner as can be repeated without changing the relative position of the two parts, cope and drag.

Along with this I hear some of you saying that there is no excuse for having loose

pins, and I acknowledge that I haven't got anything to say in the defense of such, but at the same time loose pins are with us, and it saves money sometimes to be able to get along with something that is not as perfect as it should be. I believe myself in not having loose pins, but then if an occasional one should appear, there is no reason to put on half an hour's red tape or more in getting it on a sound basis. The workman who can work to advantage will find it more agreeable to have things fixed up at intervals instead of doctoring every now and then. Loose pins will show in spite of all care, but by closing a flask as in Fig. 2 the result will be approximately true.

## Burning of Castings.

By W. R.

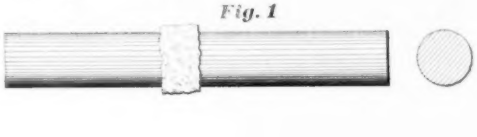
To those who may not understand what is meant by the burning of castings, perhaps it would be as well to explain that it simply means the soldering of a defective part, by pouring fluid metal on it until such time as said part has become fused, and when this is attained the space thus formed by burning is filled with fluid metal, or it may be by fusing the ends of two separate pieces and uniting these into one. Care must be taken in the operation to give plenty of metal for chipping, turning or finishing. If this be attended to as directed and the burned part be finished for a short distance outside of the new metal it will almost be impossible to detect where the joining of the old and new metal takes place.

Burning is a device in the art of molding that the fewest number, who attempt it, do well, and this I believe in a great measure accounts for the prejudice which many engineers have against burning. Many attempt it without a due understanding of its essentials. No one can burn who has not an intelligent knowledge of the laws of expansion and contraction. This I admit is not a branch of the trade that is at all times accessible to the ordinary molder; therefore it is to those who are so unfavorably situated that I specially write this article. Hence I am sanguine enough to believe that this article will in a great measure assist them to perform such an act if ever they require to do it.

Burning is an easy matter if we simply look at it as a hole in the casting, and a pouring of metal on such a part until it becomes fused and fluidly filled up to our satisfaction, but having done nothing to expand this part of the casting previous to burning (that is to say if it be of cylindrical form) there is no chance whatever of the burning being successful. Let such a burning be ever so good the likelihood of the afore-mentioned casting holding water would be small indeed.

By the foregoing it is not to be inferred that to burn without heating the casting to a dull red heat is an impossibility. All castings or parts of same that may be said to have no irregular shrinkage such as Fig. 1 are quite safe and have no need of previous heating.

*Fig. 1*



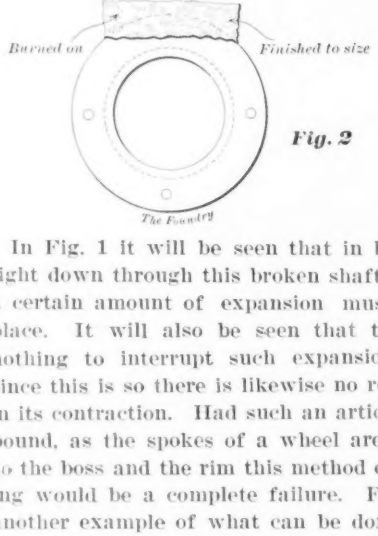



*Fig. 2*

In Fig. 1 it will be seen that in burning right down through this broken shaft or bar a certain amount of expansion must take place. It will also be seen that there is nothing to interrupt such expansion, and since this is so there is likewise no restraint in its contraction. Had such an article been bound, as the spokes of a wheel are bound to the boss and the rim this method of burning would be a complete failure. Fig. 2 is another example of what can be done with perfect safety without previous heating whether such a flange be attached to a pipe or any other cylindrical casting provided the flange be broken not too near the fillet of same, otherwise there is danger of the casting cracking from expansion. Also it is better in such cases as this to make sure that the burn, that is the new metal, will be sufficiently far into the flange to admit of the bolt hole being drilled entirely in the new metal, because there is little likelihood of the drill passing through the chilled metal which is sure to be formed at the joining of

the old and new metal. What is written here as applying to the burning of cold castings, can be applied with safety to any terminal point of a casting, as it must be obvious that these referred to are free to expand and contract during operation of same.

Having shown in a practical way those classes of castings which can be burned with safety without heating, I will now give one or two examples where heating is an absolute necessity.

Take for instance a casting with a cylindrical body, which may either be cylinder, pipe, valve, or plunger barrel. Any of those castings named having a defective part there is no difficulty of burning such a casting to withstand as much pressure, if not more, than the soundest part of the entire casting, provided it is gone about in a right way. The modus operandi in detail I cannot give in such a short article as this, but it is necessary that I should lay down at least the first principle of the process. Place the casting on the dead level with the part intended to be burned, secure the inside of same by ramming it properly with sand or otherwise. Next surround the casting, or as much as may be suitable, by a perforated brick wall, sufficiently high to enable a plate or more to reach across thus forming a temporary furnace. Then build a fire and light it up and when the smoke has almost exhausted itself, roof across with the plates mentioned, and when the casting has reached the dull red heat, apply the ladle with its metal contents and burn. Immediately this is done cover over the fluid metal of the burn with charcoal; this secures it from atmospheric chilling and in consequence of which the metal is softened to the extent of easy chipping or filing. The plates should again be thrown over this temporary furnace and the whole thing allowed to cool as if it were an annealing furnace. In such treatment as above mentioned no one need fear the result, as I have never seen it fail to give the greatest satisfaction, no matter what test it had to undergo.

## Personal.

I. J. Cahill has taken charge of the Globe Foundry at Millbury, Mass.

Louis Ladan will hereafter be at the helm of the Norwood (Mass.) Foundry Co.

Arthur Cushman will preside over the foundry of the recently organized Standard Foundry Co. at Worcester, Mass.

M. R. McKinley has resigned his position as assistant superintendent at the Moline Plow Co. shops and has purchased an interest in the Morris & Lewis foundry in Rock Island, Ill. Mr. McKinley will have the superintendency of the foundry.

R. E. Coleman, formerly superintendent of the Union Car Co., Depew, N. Y., has been appointed superintendent of all the foundries controlled by the American Car and Foundry Co. Mr. C. F. French has been appointed as superintendent at the Depew Works.

## Departed.

Harry S. Hill, a member of the Taylor & Wilson Foundry and Machine Co., Allegheny, Pa., died in Pittsburg a short time ago.

Samuel Edgerton, for many years connected with Ralph B. Francis in the foundry business at Palmer, Mass., died in that city recently at the age of 85.

John Neill, one of the oldest stove manufacturers in Ohio, died in Portsmouth, August 13, aged 76. He was born in Londonderry, Ireland, and started his first stove foundry in New Laurel, Ind., removing to Portsmouth in 1853.

John C. McCloskey, a well-known and respected citizen of Altoona, Pa., died of infirmities due to old age, at his home, August 9. He had been ill since last November. The deceased was born in Duncansville, April 8, 1834. Mr. McCloskey was for a number of years foreman of the Pennsylvania railroad wheel foundry, but was forced to give up his position on account of ill health.

James Dripps, one of Washington's (D. C.) pioneer foundrymen, and for many years engaged in that business under the firm name of Pettit & Dripps, died recently in that city, aged 73. Smith Pettit, senior member of the firm, died November last. The death of Mr. Dripps marks the passing of a concern that was for a long time connected with the principal business interests of the nation's capital.

Albert A. Tapscott and Patrick E. Hourihan have leased the plant of the Somersworth (N. H.) Machine Co.

## Blast Furnace and Cupola Practice.*

### With a Discussion on the Use of Casting Machines for Foundry Iron.

By EDGAR S. COOK, POTTSTOWN, PA.

The increase of the daily product of the modern blast furnace has called the attention of managers to the necessity of improved methods for casting and handling the large tonnage of iron. Not many years ago, all the pig iron made was cast in pig beds, molded in sand. Even with moderate products, there has always been more or less trouble in securing men to remove the iron from the cast-house. Few men, comparatively, have the physical strength, or having the strength, care to perform the exhausting labor, day after day, Sundays and legal holidays included. Blast furnace work is absolutely continuous. We have no holidays, and if the men to fill certain positions are not on hand, they must be replaced or the furnace stopped. Frequent stoppages are costly and disastrous.

The difficulty is not alone with the removal of the iron from the beds. After the iron is tapped from the furnace and distributed into the twenty or thirty beds, each "pig" must be separated from its "sow" and the "sow" running the length of each bed, must be broken into lengths corresponding approximately with that of the pig. This work is usually done when the iron has become sufficiently solid to bear the weight of a man, and not bleed or run when separated. This is hot and exhausting work, especially in the summer months, and not infrequently is the source of the greatest anxiety to the manager. Many men cannot withstand the burning heat and succumb, thus discouraging others, who are only too ready to avail themselves of any excuse to escape the trying ordeal. The pigs must be separated from the sow and the sow broken, otherwise the iron cannot be removed and the beds molded for succeeding casts—the casts following one another every four or five hours.

Various mechanical appliances have been proposed from time to time, but one objection or another prevented their adoption. Furnaces connected with steel works substituted for the sand beds, iron molds, or chills, as they are termed. These chills obviated the necessity of molding in sand, thus economizing in labor and saving time, and thereby increasing the capacity of the cast-house, but their use did not overcome the necessity of breaking the "pigs" from the "sow," etc. The labor of removing the iron from the cast-house also remained the same. With the advent of the basic open-hearth steel furnace, the demand for iron low in silicon and free from surface sand, brought about the introduction of iron chills or molds, by merchant furnaces proposing to make basic iron—that is, iron of a composition to suit the requirements of basic steel manufacture. Many of the casts run into these chills, upon being analyzed, were found not to meet the specifications of the buyer, being too high in silicon or too high in sulphur. This iron became known as "misfit iron," necessitating its sale for some other purpose. The high sulphur pig was found suitable for puddling, a reduction in price being made to effect a sale simply because it was "misfit iron." The puddle mills were thus made acquainted with sandless pig iron, and although introduced at some disadvantage, it is now used on the same terms as pig cast in sand. Some mills express a decided preference in favor of the clean iron, free from adhering sand. The misfit basic, high in silicon, found its way to foundries, to be remelted and run into castings. It might or might not have been of a composition to suit their requirements. Whether it was or not, it labored under the disadvantage of being a "misfit iron," and was naturally looked upon with suspicion.

Casting machines or tables are now replacing the chills in the Bessemer furnaces of large capacity. These tables, when well constructed, are likely to give the relief so long sought for, obviating the necessity for a cast-house and do away with the exhausting and troublesome labor referred to. The furnace is tapped at such intervals as may be found convenient, and the molten iron run into ladles or cars of 20 tons capacity or larger. Each car as filled is then emptied into molds of cast iron or of stamped steel plate, coated with a wash of clay or lime, the mechanism of the table being so arranged that the molds move slowly in front of the ladle. It is evident that each lot of 20 tons, the ladle serving as a mixer, when poured into molds of the same section and cooled under the same conditions, must be practically uniform.

*Paper read before the Philadelphia Foundrymen's Association.

one pig compared with the other. The steel trade, having arrived at an exact knowledge of the kind of pig iron required, is able to specify the analysis wanted. All purchases are made without reference to the accident of fracture. The limitations as to silicon and sulphur, to say nothing of phosphorus, are the determining factors. To the best of my information, sandless pig is preferred by Bessemer works to that cast in sand, while for basic steel manufacture, sand pig will not be accepted.

Foundries connected with steel works have been using sandless pig for a great variety of castings with entire satisfaction, the management simply specifying the analysis of the pig required. From time immemorial, the general foundry trade has been judging and determining the comparative value of iron for different purposes, by the fracture, without reference to the chemical composition. The experienced, observing man is able to make, at times, fairly correct guesses as to the quality of an iron, drawing his conclusions from the color of the fractured surface, the size of the crystallization, as well as the face of the pig. Demands on the foundry are now far more exacting than was the case years ago, and the margins of profit much smaller, calling for more exact methods, less guess-work, and a greater certainty as to the character of the castings.

It has been a matter of the greatest surprise and wonderment to me, upon visiting certain foundries, where the "rule of thumb" held perfect sway to the entire exclusion of any technical knowledge, that the mistakes and errors were not more serious practically and disastrous financially. If I were compelled, however, to make a choice between a practical man, thoroughly well acquainted with foundry work, a man of good judgment, but possessed of no chemical knowledge, and a theorist, equipped with all that technical schools and a course of chemistry can give, but with little or no practical acquaintance with foundry conditions, I would certainly take my chances with the former. There is no reason, however, why the better qualities of both may not be combined in the one man. There is now so much literature on the subject of cast iron as applied to foundry work, that any fairly intelligent man can soon acquire all the chemical knowledge required to assist him in adjusting the mixture of iron, guided by the analyses furnished by an expert chemist, to suit the varying requirements of complicated or simple castings.

The most successful blast furnace managers are those who, by daily contact with furnace operations, and close application, mastered the practical details and then supplemented this training by technical studies, to gain a knowledge of the value of the composition of ores, etc., as well as of the slag and iron product.

When I first became acquainted with blast furnace operations, they were conducted entirely on a system of guess work, so far as the material filled into the furnace was concerned. Analyses of slag or of the iron produced were seldom or never made. If anything went wrong, causing irregular work and reduced product of iron, with consequent increased cost, the blame was invariably placed upon the ore or coal. It was so much easier and satisfying to place the responsibility for one's own mistakes and errors upon the party supplying the raw material. As long as this system prevailed, there was no chance of any improvement. The modern blast furnace became a possibility only with more intelligent management, the management that without neglecting the teachings of practical experience, availed itself of all the help afforded by chemistry, to unfold a knowledge of the composition of the material used, the value of the various elements in their numerous combinations, as well as the composition of the iron produced. The data thus acquired by blast furnace managers as to the quality of various grades of pig iron, the influence of silicon and sulphur, etc., have been of more or less value to foundries.

We have thus been enabled to determine approximately the composition of pig suited to varying foundry requirements, supplemented by the study of analyses of castings that were proved to be satisfactory. A blast furnace run in the old way could not now exist in competition with one managed under scientific methods.

Unless all signs fail, the same rules of growth and existence will hold good as applied to the foundry trade, and the "survival of the fittest" will, sooner or later, compel all foundries to avail themselves of the help afforded by scientific methods. Many foundries are under most excellent management.

There are many able men connected with foundry work, combining practical experience with technical attainments. These

men know what they want and are thus able to specify as to the composition of the pig iron required, and their specifications, as a rule, are reasonable from the standpoint of the blast furnace manager, which cannot be said of all the specifications submitted by agents. To such men the accident of fracture is immaterial, so long as the elements named are within the limits specified. The percentages of silicon and sulphur determine, in great measure, the adaptability of an iron for general foundry work or for special work. They take advantage of the general trade custom of grading by fracture, the market price varying within the grade, to buy a No. 2 iron and at the same time specify a composition that can only apply to a No. 1 iron. As soon as foundries generally are sufficiently well informed as to the composition of the iron they require, to specify the limits of silicon and sulphur, just so soon will the old system of grading by fracture disappear, and they will then be prepared to take advantage of the benefits afforded by the use of sandless pig iron or pig cast into iron molds.

It would be presumptuous for one having no practical acquaintance with foundry conditions, to advise or dictate to experienced men, but I am at a loss to conceive what benefit can be derived from converting into slag 20 or 30 pounds of sand for each ton of pig melted in the cupola. There is a bare possibility that the slag thus made, in connection with the ashes of the fuel, is of assistance in removing the sulphur of the fuel. If this should prove to be the case, it would be a simple matter to add to the charge of clean pig, as much sand as may be required to make the necessary volume of slag. Much of the difficulty experienced in soft and gray foundry work, is due to the melting of the pig in the cupola, in contact with mineral fuel carrying more or less sulphur.

The presence of manganese in the pig helps to remove the sulphur, but it is rather an expensive flux, paid for as it is, at the price of iron. The same may be said of sand, if its only use on the pig is to increase the volume of slag. While it is true that a certain allowance is made for sand on the pig, it is doubtful whether the purchaser obtains 2,240 pounds of actual iron for each ton. The allowance made for sand is to cover the loss in handling, so that the purchaser may not receive less than 2,240 pounds of iron, plus the sand that adheres tightly. With the use of sandless pig the purchaser would always receive 2,240 pounds of iron.

There are many points of resemblance between blast furnace and cupola practice, enough to permit of arguing from one to the other. We have found that temperature, other things being equal, determines the percentage of sulphur in the pig. At high temperature of crucible or furnace, there is but little affinity between iron and sulphur; the slag takes up the sulphur, leaving the iron comparatively free. An unexpected stoppage, or a leaky tuyere, or any cause lowering the temperature of the crucible, will act to reverse these relations. The sulphur will attach itself to the iron. Sulphur in the pig increases the percentage of combined carbon and lowers the graphitic, thus affecting the crystallization, but not necessarily changing the percentage of silicon. Thus it is, that we occasionally get iron high in silicon, and, at the same time high in sulphur, high in combined carbon, and low in total carbon. This iron might show a fairly good fracture in the sand pig, but if cast in an iron mold, the high sulphur would develop a chill in spite of the silicon, thus indicating very plainly that the iron was not suitable for light castings or castings that were required to be soft enough to machine easily.

In the cupola, however low the pig iron may be in sulphur, if not melted down hot, sulphur will be absorbed from the coal or coke, and the casting will be high in sulphur. Very few cokes will average less than 1 per cent. of sulphur, while anthracite coal will carry from ½ per cent. to 1 per cent. High sulphur in the casting will cause the iron to be hard, owing to formation of combined carbon, and coming into contact with the damp sand of mold, it will take a chill and excessive shrinkage will develop.

The knowledge that the iron mixture is all right would enable the manager to locate the cause of the trouble. While it might be easier to blame the pig and claim a reduction in price, yet this does not remove the real cause and the trouble is likely to reappear again and again, causing delays and loss.

While it is perfectly feasible to increase and multiply many times the percentage of sulphur in the pig, by re-melting in the cupola at too low a temperature, no elevation

of temperature will reduce the percentage of sulphur in the melted iron below the percentage contained in the pig or scrap charged, though good cupola practice may prevent any considerable increase, through absorption of sulphur from the fuel. The blast furnace and puddling furnace and possibly the basic steel furnace, can break up the combination of iron with sulphur and eliminate the sulphur, but the cupola cannot. Hence all scrap, as a rule, carries a larger percentage of sulphur than the higher grades of foundry pig iron. All grades and compositions of pig have their uses, and even sulphur is valuable to fulfil certain requirements. The whole difficulty consists in knowing just what is wanted in any particular case and then adjusting mixture to suit.

In "blowing in" or starting a blast furnace, some years ago, the first couple of casts were usually worthless, a sort of nondescript iron, fitted neither for foundry nor mill use. It was made with a hot furnace above the tuyeres, but in the crucible, below the tuyeres, it underwent changes for the reason that the crucible was not hot enough to maintain the temperature of the slag and iron. This was corrected by increasing the blank charge of fuel to such an extent that there was no possibility of either slag or iron reaching the crucible until its temperature was sufficiently high to prevent any change in either. Now, the first cast of iron will show about the same quality of product as any of the subsequent casts. I would argue from this experience that in cupola practice it not infrequently happens that melted iron reaches the bottom of the cupola before the temperature is sufficiently high to prevent the iron from undergoing chemical changes.

When this iron is poured into molds, the castings are often worthless. The iron as charged at the top may be all right; as drawn at the tapping hole, it is all wrong. Blaming the pig and changing the mixture will not correct the fault. Positive knowledge as to the composition of the iron mixture and equally positive data as to the requirements of the castings to be made, would remove elements of uncertainty, and enable the manager to locate the trouble, so as to avoid a repetition.

(To be continued.)

## Among the Foundries.

The Central Foundry Co. will enlarge its plant at Anniston, Ala.

P. McNaughton has started his new foundry at Charlotte, Mich.

The Wheeler Foundry Co., of Worcester, Mass., is extending its foundry.

The Sterling (Ill.) Manufacturing Co. has begun operations in its new foundry.

The Industrial Works, Bay City, Mich., are preparing plans for a large foundry.

James Wilson and Frank Pritchess will operate a foundry at Mount Pleasant, Utah.

The Structural Iron Co., of Baltimore, will erect an iron and brick foundry to cost $10,000.

The American Bell Foundry of Northville, Mich., burned some time ago, is being rebuilt.

The Kohler, Hayssen and Hehn Mfg. Co. of Sheboygan, Wis., will erect a new foundry 66x260.

The Jefferson (Texas) foundry has been purchased by the Tennessee Coal & Iron Company.

The Milwaukee (Wis.) Harvester Co. has commenced the erection of a foundry to cost $60,000.

The Monessen (Pa.) Foundry and Machine Co., recently burned out, will rebuild on a larger scale.

The E. P. Allis Co., of Milwaukee, have leased the Lake Erie Engineering Works at Buffalo, N. Y.

The Alta Implement Co. of Rochester, N. Y., has prepared plans for a foundry building to be 40x125.

The D., L. & W. R. R. foundry at Scranton, Pa., was flooded recently by the bursting of a sewer pipe.

John W. Holmes has for himself and others purchased the Metropolitan Pipe Foundry at Metropolis, Ill.

The Baker Forge Co., at present located in Allegheny, Pa., will remove their plant to Rankin Station, Pa.

The Midland Foundry and Machine Works Co., of Denver, Col., is preparing plans for a new foundry.

Wm. Fenton has assumed control of the foundry located at Hudson, Mass. About twenty men will be employed.

The Northwestern Malleable Iron Works of Milwaukee is planning the erection of additional foundry facilities.

The Pennsylvania Bath Tub Company has purchased the plant of the Derwent Foundry Co., at Ellwood City, Pa.

The Brown Cotton Gin Company of New London, Conn., has had plans prepared for an addition to their foundry.

The N. O. Nelson Foundry Co. are building a large plant at Bessemer, Ala., for the production of sanitary supplies.

The Enterprise Foundry Co., Muskegon, Mich., has been compelled to increase its capacity to keep up with orders.

The Hunter Machine Co., North Adams, Mass., intend to erect a large foundry building to meet increased requirements.

The New York Air Brake Co., of Watertown, N. Y., has leased an additional building to be used as a brass foundry.

The Woolley Foundry & Machine Works, of Anderson, Ind., have increased their capital stock from $30,000 to $75,000.

The National Malleable Castings Co., of Indianapolis has had plans prepared for an addition to their already large foundries.

The Fuller Cotton Machine Co., of Memphis, Tenn., write us that they will shortly be in the market for foundry equipment.

The Bessemer (Pa.) Gas Engine & Clutch Co. has commenced the erection of a foundry to be operated in connection with their works.

John Clune has purchased the Blake foundry at Cheboygan, Mich., and will place same in operation after installing new machinery.

E. S. Jennings has purchased the Athens (Ohio) Foundry and Machine Works, and will make improvements throughout the plant.

The Sprocket Chain Mfg. Co., of Detroit, Mich., manufacturers of malleable castings, has changed the firm name to the Buhl Malleable Co.

The Bellows Falls (Vt.) Machine Company has in contemplation a number of improvements which include a new foundry of modern construction.

The Hainesport (N. J.) foundry, operated by J. D. Johnson & Co., is making sufficient additions to its plant to give employment to a hundred more men.

The Bettendorf Metal Wheel Company, of Springfield, Ohio, is building a foundry 60x175 feet, and expects to have it completed by September 15.

Plans have been prepared to increase the plant of the Island Foundry Company at Mechanicville, N. Y., so as to give room for fifteen additional molders.

Merrill & Broeg, of Foxcroft, Me., have dissolved partnership, Mr. Broeg retiring from the business, which will be carried on by Mr. Merrill in the future.

The Cleveland Wheel and Foundry Company of Cleveland has adopted on amendment, changing its name to the Maher Wheel and Foundry Company.

The Bessemer (Ala.) Foundry and Machine company, under the control of Louis Hoster and H. T. Muniz, are rapidly extending their plant and installing new machinery.

Whitney & Kemmerer, Philadelphia, and owners of a foundry at Hainesport, N. J., are reported as overhauling the latter and making arrangements to operate it on a large scale.

The Lebanon Hardware Company, composed of M. A. Dunlap, W. H. K. Bush, and M. R. Fox, has purchased the old Mish foundry, at Lebanon, Pa., and will at once commence operations.

The partnership which has existed between Sewall J. and William H. Watson, of Bath, Me., has been dissolved and the stove business will hereafter be conducted by William H. Watson.

The Foran Foundry and Mfg. Co. has been incorporated at Flemington, N. J., by John Foran, M. M. Foran and Henry A. Fluck. This company succeeds the Foran & Abendroth Mfg. Co.

The Malleable Iron Fittings Co., of Branford, Conn., has let a contract for an addition to their foundry to be 134x200 feet. The construction of the roof will be done by the Berlin Iron Bridge Co.

A dispatch from Cincinnati states that the Wm. Resor Foundry Co. will be reorganized and again placed in the front ranks of American stove manufacturers.

The Le Baron Foundry Company of Middleboro, Mass., is considering enlarging the present plant, there being a demand for cotton machinery just now, and the capacity of the foundry is insufficient to meet it.

A. & T. McKenna, brass founders at 220 Third avenue, Pittsburg, have purchased a plot of ground on the corner of Ross and Water streets, and will erect a six-story brick building to increase their capacity, part being used as a foundry.

The Lorain (Ohio) Foundry Company has found it necessary to make a large addition to their building in order to accommodate their increasing business. The addition lengthens their mainbuilding 64 feet and is the full width of the building.

The Foran Foundry and Manufacturing Co., of Flemington, N. J., have commenced the erection of a brick addition to their already extensive plant, 165x80 feet, which will be equipped with cranes and other appliances for the casting of heavy machine workwork.

It is reported that F. B. Nichols of Bessemer, David Giles of Chattanooga and James Brown of Birmingham, Ala., are organizing a new company to build several cast iron pipe foundries, which will be operated in opposition to the United States Cast Iron Pipe and Foundry Company. It is said that contracts for iron to be used in the new plants have been awarded to the Tennessee Coal & Iron Company.

A foundry plant to cost over $50,000 is being built by the Milwaukee Malleable & Gray Iron Works Company, which was recently formed by John Suetterle, Adam Loeffelholz and William Gutenkunst. The plant is being put up in connection with the Milwaukee Hay Tool company plant, which is operated by the same owners.

According to press reports the recently organized Pennsylvania Malleable Company expects to make their new plant the largest and most modern works of its kind in the world. The company has secured ten acres of land on the Ohio river adjoining the new plant of the Pressed Steel Car Co at McKees Rocks, a suburb of Pittsburg. The capital stock of this new factor in the malleable iron business is $600,000.

Extensive operations are being made at the Ford & Kimball foundry at Concord, N. H., and when completed the foundry will be run 24 hours a day. The reason for this is that the Boston & Maine Ry. Co. has determined to make its own freight cars hereafter, a recent trial at the Concord shops having convinced the management that the road can build its own cars as cheaply and as speedily as they can be built anywhere.

The Sherriff Machinery Company, of Pittsburg, has leased the Darragh foundry at Bridgewater, Pa., and will operate it as the Darragh-Sherriff Foundry company. The foundry is owned by S. H. and M. B. Darragh, and has been operated for 63 years without a shut-down. About 35 men are employed. The Sherriff company has been compelled to secure additional facilities because of the immense amount of orders being received.

The old Government foundry in the Brooklyn navy yard is being renovated and reconstructed. It will be divided into two parts by a wooden partition. One room will be retained as a foundry and the other will be used as a shop for heavy machinery tools. The old machine shops of the Navy Yard were destroyed by fire some months ago. Bids are being received by the Navy Department in Washington for the erection of new shops. They will comprise a main building covering an area of 46,300 square feet with two wings, each about 350 feet long and 90 feet wide.

The Niles-Bement-Pond Company, comprising four of the leading tool and machine-making concerns of the United States—the Niles Tool Works Company, of Hamilton, Ohio; the Pond Machine Tool Company, of Plainfield, N. J.; Bement, Miles & Co., of Philadelphia, and the Philadelphia Engineering Works, of Philadelphia, has been incorporated with a capital of $8,000,000.

At a meeting held August 15, Col. Robert C. McKinney, of Hamilton, Ohio, was elected President, and Mr. Chas. L. Cornell, of the same place, treasurer. The Board of directors is made up as follows: Alexander Gordon, president of the Niles Tool Works Company; Chas. A. Moore, of Manning, Maxwell & Moore, of New York; Clarence S. Bement and Frederick B. Miles, of Bement, Miles & Co., Gordon Shillite, Thos. T. Gaff and Daniel H. Holmes, of Cincinnati; Frederick W. Gordon, of Philadelphia; Geo. T. Reiss and James K. Cullen, of the Niles Tool Works Company; E. C. Burke, of

Cleveland, Ohio; Walter L. Clark, of the Niles Tool Works Company; A. C. Stebbins, of the Pond Machine Tool Company; W. S. McKinney, of Pittsburg, and Col. Robert C. McKinney. The other officers of the company are Jas. K. Cullen, first vice-president; A. C. Stebbins, second vice-president; W. L. Clark, third vice-president; E. M. C. Davis, secretary; F. B. Miles and George T. Reiss, engineers.

This company has been brought into existence along lines that are unique. There have been no promoters, and no promoters' fees. No stock has been offered to the public and none will be. The whole is taken by the parties interested in the various plants, and the management will remain in practically the same hands as heretofore. The new company will practically control, as the old concerns have controlled, the heavy machinery trade of the country. Col. McKinney and Col. Gordon have been principally instrumental in bringing about the present arrangements.

## As an Outsider Sees Us.

BY HENRY PITCHER.

"It is not infrequently the case that an apprentice to the molding trade serves the first year without pay, with probably $3 per week the second year, $4 the third and $5 to fourth. As a journeyman he would receive $15 per week if a fairly good workman, or double that sum if a specialist. Work at molding is continuous all the year round. Considerable capital would be needed to start and operate a foundry."

So writes Barton Cheyney in the Ladies' Home Journal for March. Mr. Cheyney has been engaged in telling of the opportunities which exist in different trades and it is but natural that he should have run across the molders, as its members are too numerous not to be noticed.

The trouble with writers in handling subjects of this nature is that they merely present conditions as they exist in a small portion of the country.

I don't doubt for a moment but what Mr. Cheyney tried honestly to tell the 750,000 subscribers of the Ladies' Home Journal (by the way, there are a few gentlemen among these) what he actually thought were the conditions of the trade, but the fact is, nevertheless, that his description fits but a small portion of these United States.

In the first place it is something very unusual for an apprentice to serve the first year without pay. While I believe this is common in Great Britain and the continent, conditions here does neither provide the parents who are willing or able to donate food and clothing to their able-bodied sons while they are working nor the mentally and physically sound young men who will work in a foundry, I said foundry, without pay. The apprentices who do not get $3 a week the first year are scarce, and let me further say, that the boy who doesn't earn his $3 is scarcer still.

A fairly good workman may get $15 a week; he may get more or less. That depends upon the backbone he has got to stick up for his rights more than upon his skill. I have seen fairly good, steady workmen (they were too steady in fact) receive but a $1.50 a day, and I have known good machinery molders to get as high as $4 for the same length of time.

As a specialist the molder will not always receive $5 a day, as Mr. Cheyney would lead us to believe. He may sometimes only receive 10 per cent above the rate of a laborer, and if the latter works for a $1 a day the molder is a long ways from $5. Of course there are specialty shops, working piece work, where a man with the strength and constitution of an ox can make $5, but these V jobs are as a rule neither lasting nor frequent.

I have often thought it a pity that the jobbing molder should work years to gain his experience and then after all his application and study be forced to go home Saturday night with less money than the man who can only make one kind of a casting.

Work at molding is not continuous the year around, at least shops where it is are the exception. Work may be pretty steady just now, but it has been my experience that dull periods come for all shops some time.

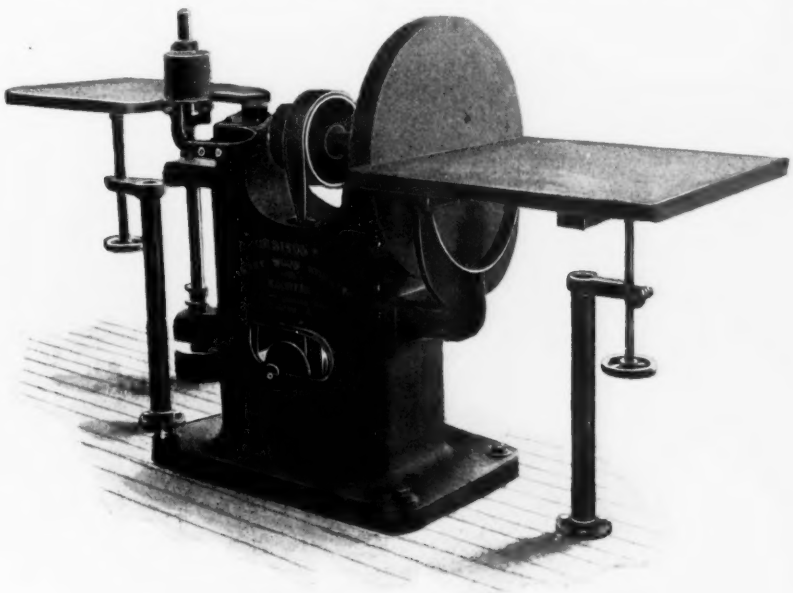
Considerable capital is not needed to start a foundry. Lots of them are started with nothing but nerve and scrap and come out all right, too, while those who began with considerable capital go to the wall.

With these few corrections Mr. Cheyney's paper will tell something about the molders' trade.

**Orbison's Garnet Wood Working Machine.**

We show herewith a Garnet wood working machine designed by a practical pattern maker of large experience, who has made a study of economy in pattern construction. It was designed especially for pattern shop use, and possesses novel and valuable features in its construction contained by no other machine on the market.

The frame is of heavy box section with a wide base, and all bearings are cast on solid, thereby preventing all possibility of vibration of the spindles, disc or drum when run at a high speed. The spindles are of the best steel, and run in bearings lined with the best babbit metal. The face plates or discs are guled up in sections in such a manner as to insure them always keeping true. The garnet paper is intended to be glued onto face plate, and as each layer is worn out, fresh paper can be glued on top of another for several times, when it can all be removed. It has been found that glueing the paper to the discs is the only practical way of securing it in order to be able to finish the work perfectly true and prevent the rounding of corners. Two discs are furnished with each machine, so that a fresh one is always ready when the other is worn out. They are made 26 inches in diameter, although any diameter desired can be furnished to meet the class of work to be done. The drum is made of cast iron, cored out, so as to make it as light as possible. The garnet paper is glued edge to edge onto a wood dove-tail which is fitted into drum tightly. The most accurate work can be done on this drum, which is intended for finishing inside curves of patterns. Upper end of drum is threaded to suit spindle, by which means it can be adjusted to any desired hight and is held by means of a lock nut. The tables are made of cast iron. They are adjusted by means of a screw and hand wheel, supported by means of pillars or posts which are secured to floor. By this adjustment any angle or taper can be put on a pattern. Provisions are made for locking the screws at any desired position, so that the table cannot move when once set.



ORBISON'S GARNET WOOD WORKING MACHINE.

All revolving parts are accurately balanced to insure smooth running. The machines are made in two designs; our illustration shows design A. Design B has drum and drum table placed on side of frame.

The Orbison Garnet Wood Working Machine is being placed on the market by the S. Obermayer Co., Cincinnati and Chicago, who will forward further particulars upon request.

## Old Scotch Foundry Practice.

Editor of The Foundry:

In the west of Scotland and in the outskirts of the city of Glasgow, there is an old foundry doing a good business in these days whose methods of working are in no way changed with up-to-date foundry equipment, that is to say, their motive crane power, etc., is just the same as it was before the days of steam, hydraulic, or electrical machinery.

I do not intend to write an article on this old shop, although it has a uniqueness of its own, but being a reader of your journal and a practical molder, I have thought that what is in practice in this old foundry, which, so far as I can gather, has long since seen its jubilee, would be of some little interest to the readers of The Foundry.

In these days of hurry-scurry we hear so much of modern workshop practice that unless one is up-to-date in everything that is new for the cheapening of production, one is afraid of being left out in the rush for the front in competition. This in my opinion is not always so and in proof of this I take this old shop as an example, which may be said to have outlived some of the modern foundries which have come and gone, with the avowed intention of sweeping everything that was old and ancient into oblivion. Such has been the bounce of the modern foundry company promoters, but alas for their poor dupes who have been beguiled to the extent of losing their all.

Modern machinery molding is a phrase I have but little liking for, as my opinion is that anything, however good in the matter of machine molding, is not worthy the paper that advertises it if it has not for humanities' sake the reducing of the physical toil which too frequently accompanies light repetitive molding.

But to return, I must state that the question of modernizing has been frequently talked about with the proprietors of the shop in question, but as the cost was likely to outrun the profit they prefer to work away on the old lines. This financial aspect of improvement is the stumbling block to many, and in this case would likely mean a doubling of the rent, which in turn would require a doubling of the profits; a thing not likely to be attained.

I need not give details of the old engine which was driving one of the most primitive looking fans that a person could imagine, the case being oval in section and with four internal blades produced a wind pressure of 10 inches on the gauge, the results of melting being a surprise to me. I here append one of the several special casts lately made:

| | |
|---|---|
| Coke | 2,324 lbs. |
| Scrap | 8,960 lbs. |
| Pig | 20,160 lbs. |

Full time of blowing four hours, metal at a milky white heat throughout the heat.

Another cast I noticed whose total was 112 lbs. more, took four and a half hours, this being caused by the scrap being somewhat dirtier, in consequence of which the tuyeres bridged over and thus retarded the melting. All the material as noted being carefully weighed and time exactly taken.

The foregoing seems to me not inferior results to many more modern and expensively equipped foundries. Cupola employed for this work, approximately, would be from 34 to 36 inches, inside diameter, and tuyere pipes, two in number, directly opposite each other about 20 inches from bottom or hearth of cupola.

Although I may be a somewhat antiquated molder, having read a great deal more than I have ever seen, I rejoice in the interchange of opinions between this country and that of your own, and if this letter of mine be the means of others giving a comparative statement of cupolas or foundries, old and new, it will have served the purpose for which it is written.

AULD LANG SYNE.

Glasgow, Scotland.

---

## Fire Fiend.

Meerbach & Schneider's foundry at Philadelphia was damaged $1,500 by a recent fire.

Fire destroyed the casting department of the J. G. & W. Campbell foundry, Butler, Pa. Loss, $2,000.

The Tarrant Foundry Co., Chicago, had their plant badly damaged by fire August 17, entailing a loss estimated at $10,000.

The Molding room of the Benedict Mfg. Co. at Salamanca, N. Y., was burned recently together with a number of valuable patterns.

### Igniting Tubes.

In the June issue of this paper someone made an inquiry as to the kind of metal employed in tubes of gasoline engines, to which Mr. J. S. Rounce, of Ellsworth, Wis., replies that they are made from nickel alloy rods imported from the Westfalisches Nickelwaizer, for whom Herman Baker & Co., 101 Duane street, New York, are the United States agents.

### An All-around Boom.

Writing from Birmingham, England, one of our correspondents says that trade prospects there are very bright. Raw materials are high in price and labor scarce. Orders are coming in far faster than they can be executed.

According to the Connellsville Courier the Reese-Hammond Fire Brick Co. of Bolivar, Pa., has purchased the property of the Glade Run Fire Brick Co., located at Fairmont, W. Va. As the Reese-Hammond people have doubled their capacity within the past year, the purchase of additional facilities shows the demand which the present time is making upon fire brick manufacturers.

The Joseph Dixon Crucible Co., of Jersey City, have sent us a neat book entitled "Dixon's Graphite Productions," from which we learn that they make graphite into such forms as will lubricate anything from thoughts to locomotives. This may sound rather high, but anyone who has ever written with a Dixon pencil will bear us out. Bicycles are made to run easier, castings leave their molds as slick as can be, cores make smooth holes, in short, everything runs better after using some of Dixon's Graphite productions. There is no end to the list.

The Buffalo Forge Co. has received a cablegram order for the heating and ventilating apparatus to be used at the German Niles Works at Berlin, Germany, or as it is known in its native land, the Deutsche Niles Werkzeumaschinenfabrik. Some idea of the size of the machinery, together with the extent of the buildings, may be derived from the following data. The apparatus for the machine shop consists of two full housing duplex fans, each standing 180 feet tall. With these fans will be used 23,000 feet of Buffalo Fan System Heating Surface. The foundry heating and ventilating outfit consists of two full housing fans, each standing 140 inches tall. With these fans are used 10,000 feet of heater. If the pipe of the above two heaters were laid in single continuous lengths the distance covered would be very nearly six miles of one-inch pipe.

Powell & Colne, of New York City, the American representatives of the Tropenas Steel Casting Process, reports plants installed or in course of erection at the following places: Union Iron Works, San Francisco, Cal.; Milwaukee Steel Casting Co., Milwaukee, Wis.; Logan Manufacturing Co., Phoenixville, Pa.; American Hoist & Derrick Co., St. Paul, Minn.; Longview Kelly Plow Manufacturing Co., Longview, Texas; Wm. Kennedy & Sons, Ltd., Owen Sound, Ont., Can.; George H. Waring, St. John, N. B., Canada.

The Brass Founders Supply Company, of Newark, N. J., write us that they are selling five times as many improved Ribbed Flasks as they did this time last year. They also report a large increase in Foundry Supply sales, and recently shipped across the continent the entire foundry equipment for both brass and iron foundries of the new Puget Sound Naval Station at Bremerton, Washington. The improved Ribbed Flask having been specified as the only one that would fill the requirements. The Brooklyn Navy Yard have recently put in a large number of these Flasks, after having them tested on the Tabor Molding machine, which is operated by compressed air. No other Flask of the same weight is considered safe to use on these machines. Other yards have them in use, and most of the large electrical companies and large brass foundries have adopted them as their standard. The business of this company has expanded to such an extent that it became necessary to add new machinery and floor space from time to time during the year.

The foundry that buys time registers and permits its molders to hunt around for things to work with, needs a little education on how to spend its money profitably.

## NOTICE!

**Advertisements in this column, 30 cents a line for each insertion About seven words make a line. The Cash and Copy should be sent to reach us not later than the 20th to insure publication.**

**Answers addressed to our care will be forwarded.**

**TO SUBSCRIBERS**

whose names appear on our **subscription** list, we will give one free insertion under this heading to those in want of positions, the advertisement to occupy a space of not more than five lines. Additional space or insertions must be paid for in advance at regular rates.

FOR SALE CHEAP—Two 15 ton jib cranes. For description and prices address VULCAN IRON CO., Ltd., New Castle, Pa.

WANTED—Second-hand cupolas and ladles of all sizes. Give price and condition. Address M. BROOKS, Box 314, care The Foundry.

FOR SALE—One 3 to 4 ton jib crane, hand power. Blue print and price on application. JAMES LEFFEL & CO., Springfield, Ohio.

WANTED—Several thoroughly competent coremakers, experienced on large work. None others need apply. The Westinghouse Machine Co., East Pittsburg, Pa.

FOR SALE—One No. 4 1-2 Baker Blower, now running, melting 5 tons per hour in 40 inch cupola. Have built larger cupola, requiring larger blower. JAMES LEFFEL & CO., Springfield, Ohio.

WANTED—Thoroughly competent superintendent for large brass jobbing foundry, one used to large and small work. Send particulars. Address "Experienced," Box 308, care THE FOUNDRY.

WANTED—Position as foreman of brass foundry. Fourteen years' experience on heavy and light work. Can handle labor to best advantage. Competent and reliable. Address "BRASS FOUNDRY," Box 316, care The Foundry.

WANTED—Position as modeller and wood carver on ornamental patterns. Am at present employed by one of the best architectural shops in the country. Can furnish first-class recommendations. Address "MODELLER," Box 315, care The Foundry.

WANTED—Position by an all around foundry foreman who is capable of doing any kind of work that comes along in a general jobbing shop, and to melt iron that will be satisfactory to its customers. Address R. F. D., Box 312, care The Foundry Publishing Co.

FOR SALE—A foundry and machine shop, situated in Phillipsburg, N. J., on the banks of the Delaware River, directly opposite the city of Easton. Business established in 1872; capacity of foundry, 10 tons per day; machine shop equipped with modern tools and patterns; lot fronts on Pennsylvania R. R., 180x264 feet deep; Address, Vulcan Iron Works, Phillipsburg, N. J.

WANTED—A man competent to take full charge of a foundry largely devoted to manufacturing brake shoes. He must be a thoroughly up-to-date foreman of molders, well up in machine and other modern methods of molding. He must also be experienced in mixing irons and able to take full supervision of the melting. He must also have sufficient mechanical knowledge to understand blue prints and take general charge of the pattern shop. To a thoroughly first-class man a first-class salary will be paid. Address C. S. B. L., Box 302, care THE FOUNDRY Publishing Co.

---

The Chicago Pneumatic Tool Co. write us that as an indication of the constantly growing favor with which pneumatic tools are received by railroads, shipyards and manufacturers generally, their sale of these tools for August '99 has been equal in volume to total sales for the year 1897. There is hardly a branch of metal working to-day, but what has found it desirable to adopt the use of pneumatic appliances, and in plants where they started with a small outfit, they have very largely increased the number of tools in use. Every month the trade in these tools has shown an increase over the preceding month, and the vastly increased volume of business, as stated above, indicate that pneumatic tools have passed the experimental stage and are everywhere recognized as great labor savers. There is not a railroad shop of any importance in the United States where pneumatic tools cannot be found in successful operation and the constant additions being made to such equipments, show clearly that the officials in charge recognize their merits. The demand for such appliances in all branches or metal working have impelled the Chicago Pneumatic Tool Co. to bring out new tools from time to time, until they now have tools adapted to every requirement.

---

The J. W. Paxson Co., Philadelphia, has placed upon the market the Champion Sand Dryer, which has a capacity of twenty tons daily. It is made of cast iron throughout and all parts are interchangeable.